CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES

This chapter of the EIS provides an analysis of the environmental consequences that would result from implementation of the proposed RDG project and alternatives. Certain measures that would avoid or reduce impacts (i.e., BMPs) have been included in the action alternatives as discussed in Chapter 2. The environmental impact analysis documented in this chapter takes these measures into consideration.

In NEPA, an environmental *impact* or *consequence* is defined as a modification or change in the existing environment brought about by the action taken. Impacts can be a *primary* result of the action (direct) or a *secondary* result (indirect) and can be temporary (short-term) or long-lasting/ permanent (long-term). Impacts can vary in degree, ranging from only a slight discernable change to a drastic change in the environment.

Short-term impacts are environmental effects that occur during and immediately after the conclusion of construction, drilling, completion, and testing activities. Although short-term in duration, such impacts are normally obvious and disruptive. For this project, short-term impacts are defined as lasting 5 years or less. Long-term impacts are changes made in the environment during construction and operation of the project that remain for more than 5 years. Impacts that remain for the life of the project and beyond reclamation would be considered long-term.

The impact analysis evaluates the effects that would occur in the Project Area, regardless of land ownership. Although the BLM's decisions on this project would only apply to federal lands, the impacts reported for non-federal lands may occur regardless of BLM's decision. Impacts on non-federal lands are included to provide a full disclosure of effects for the complete project and to facilitate other environmental revisions and permitting associated with the project.

Alternative 1 contains BMPs proposed as part of the Proposed Action. Alternatives 2 and 3 include additional BMPs identified as environmental considerations that were developed in response to impacts identified through the scoping process. In addition to the measures identified in the alternatives, as outlined in Chapter 2, mitigation and monitoring have been developed to further reduce environmental effects and meet resource management goals and objectives for the area; these mitigation measures are disclosed in this chapter.

All phases of the proposed project, including well location, road and pipeline construction, drilling and completion operations, maintenance and reclamation, would be conducted by the RDG operators and their subcontractors in full compliance with all applicable federal, state, and local laws and regulations and within the guidelines specified in the applicable, approved APD or ROW permit.

Upon consideration of individual APDs and ROW permit applications for approval; the BLM would apply BMPs and other mitigation and monitoring measures as specified in the Record of Decision (ROD). These measures may, however, be modified by the BLM authorizing officer (AO) based on new information or to further minimize impacts. Recommendations would be

developed during field site analyses, conducted during APD and ROW reviews, and presented to the BLM AO.

4.1 GEOLOGY AND MINERALS

4.1.1 DIRECT AND INDIRECT EFFECTS

4.1.1.1 ALTERNATIVE 1 – PROPOSED ACTION

The depletion of recoverable gas from the formations underlying the RDG Project Area would be substantial. Approximations of estimated ultimate recovery (EUR), water saturation (Sw), and porosity (φ) were made by averaging the data from 3 nearby production units: the Ouray, Natural Buttes, and Greater Natural Buttes Units. The average estimated φ is 12.5%, and the average estimated Sw is 43.3% for the RDG Project Area. Under maximum proposed development, an estimated 448.3 billion cubic feet (bcf) of gas would be recovered, and these resources would not be available for future energy needs. This irreversible commitment of natural gas would be economically beneficial to the general public.

Although the compatibility of gas development with the development of other mineral resources was identified as an issue during the scoping for this EIS, no conflicts between gilsonite and oil and gas operations and development are anticipated. Oil and gas operations avoid gilsonite veins to prevent drilling difficulties, such as lost circulation.

There is no known current interest in oil shale development on public lands. Oil shale beds are protected by the casing and cementing practices employed during the drilling process; therefore, the impact to oil shale from oil and gas drilling and development would be minimal.

There is no demand for mineral materials in this area because of other, more convenient supplies of mineral materials on other public lands. No conflict between oil and gas exploration and development and mineral materials would be expected during the life of the RDG project. Although a small portion of the RDG Project Area is included in a Special Tar Sands Area (STSA), Combined Hydrocarbon Leases, issued for STSAs, allow both oil and gas as well as tar sands development. No conflict between oil and gas drilling and tar sands development are anticipated.

4.1.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Under Alternative 2 – Additional Wildlife Considerations, the same number of wells would be drilled as for Alternative 1. Several wells would be moved to other locations within a lease to afford protection of certain resources, and/or the drilling of wells would be affected by timing limitations imposed on operations to protect other resources.

- Approximately 73 wells and associated roads could be relocated to maximize use of existing vegetative and topographic features to screen the development from the viewshed of the Goblin City Overlook.

- A total of 5 wellsite locations could be affected by surface restrictions near important wildlife watering areas.
- Approximately 24 wells proposed near raptor nests could be affected by moving and/or timing restrictions.
- Timing and moving restrictions for sage grouse and burrowing owl habitat could affect 6 wells.
- Approximately 44 wells located in crucial deer winter range would be affected by timing restrictions.

Since there is some overlap in these surface use and timing restrictions, the values presented above cannot be totaled. Total production over the life of the project would be the same estimated 448.3 bcf as for the Proposed Action. There would be no anticipated conflict with other mineral resources, and geologic hazards would be minimal.

4.1.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Under Alternative 3, 50 fewer wells would be drilled compared to the Proposed Action due to prohibitions for protection of wilderness characteristics. Additionally, several wells would be moved to other locations within a lease to afford protection of certain resources, and/or the drilling of wells would be affected by timing limitations imposed on operations to protect other resources. Timing limitations and restrictions would be the same as Alternative 2, except that 128 wells proposed on BLM lands would be affected by additional timing restrictions for crucial deer winter range.

Total production over the life of the project would be 395.3 bcf, instead of the estimated 448.3 bcf of the Proposed Action and Alternative 2. The impacts to other mineral resources for Alterative 3 would be similar to those described for the Proposed Action.

4.1.1.4 ALTERNATIVE 4 – NO ACTION

As this alternative represents continued management, an estimated 55 wells could be drilled under the No Action Alternative. The total production over the life of the project would be 58.3 bcf. There would be no anticipated conflict with other mineral resources, and geologic hazards would be minimal.

4.1.2 IMPACTS SUMMARY

Under all alternatives, there would be an irreversible commitment of natural gas. Effects to other mineral resources from gas development are not anticipated, and geologic hazards would be minimal.

4.1.3 MITIGATION

No mitigation measures were identified for any of the alternatives.

4.1.4 UNAVOIDABLE ADVERSE IMPACTS

No unavoidable adverse effects were identified for any of the alternatives.

4.2 WATER RESOURCES

4.2.1 DIRECT AND INDIRECT EFFECTS

4.2.1.1 ALTERNATIVE 1 – PROPOSED ACTION

4.2.1.1.1 Groundwater

The impacts from oil and gas exploration and development would occur primarily in shallow alluvial aquifers. However, as well depths may extend to 14,000 or 15, 000 feet, similar, though lesser effects may also occur in the deeper, consolidated aquifers. Impacts could include dewatering of the aquifer, infiltration and vertical migration of drilling fluids, and upward migration of saline water and stimulation fluids (hydraulic fracturing and acidizing fluids) along natural fractures.

Usable groundwater, which is determined to have less than 10,000 mg/L of total dissolved solids (TDS) in the shallow alluvial aquifers, could be impacted by infiltration of drilling fluids from unlined pits. This impact could be manifest as spills of materials used during drilling and completion.

All drilling fluids, stimulation fluids, waste water, and water used for all other proposed RDG project gas exploration and development activities would be disposed of in an approved injection well. The Atchee No. 1 disposal well facility (Section 15 of T11S, R23E) is an EPA-approved salt water disposal/injection well intended for disposal of water produced by the RDG project. This well presently disposes of saline production water obtained from the Wasatch Formation by wells in the Rock House, Oil Springs, Rainbow, Thimble Rock, and Marble Mansion Units.

A technical review of the Atchee No. 1 disposal well, conducted during the EPA-approval process, indicated that there were no aquifers with high-quality groundwater that were encountered while drilling the well, and well casings are adequate to protect any shallow zones of fresh water during injection. Short-term impacts would be caused by local increases in water pressure near the wellbore, but these pressure increases would dissipate over time. No long-term negative impacts are expected from injection of produced water into the well, in the Wasatch Formation (DOGM 2000).

Reductions in the quality of groundwater at the shallow aquifers in the area would have indirect effects on existing water rights occurring along floodplains (see Table 3-2).

4.2.1.1.2 Surface Water

There would be minimal negative, direct and indirect impacts to surface waters from oil and gas exploration and development within the RDG Project Area. All drilling fluids, stimulation fluids,

waste water, and water used for all other proposed RDG project gas exploration and development activities would be disposed of in the EPA-approved Atchee No. 1 disposal/injection well facility. Impacts from accidental spilling of fluids from ruptured gas gathering lines would be minimal. The gathering gas lines are of small diameter, and any water collected during gas production would be removed by dehydrators prior to transmission.

There would be some erosion occurring where water is collected along roads that would eventually flow into adjacent drainages. Gathering pipelines could also affect soil erosion by channeling water flow. See Soils, Section 4.4.1.1 for a description of these impacts.

Stormwater runoff would be controlled through the implementation of Best Management Practices (BMPs) for the control of stormwater and overland flow. The BLM would use the BMP standards and guidelines as contained in the *Gold Book, Fourth Edition* (currently referenced for Field Office consideration under Instruction Memo IM-2005-247, dated September 30, 2005, and is hereby incorporated by reference). The elements in this book are guidance and can/will vary on site-by-site conditions.

4.2.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

4.2.1.2.1 Groundwater

The effects on groundwater within the RDG Project Area would be similar to those for Alternative 1.

4.2.1.2.2 Surface Water

The effects on surface water within the RDG Project Area would be similar to those for Alternative 1.

4.2.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

4.2.1.3.1 Groundwater

The effects on groundwater within the RDG Project Area would be similar to those for Alternative 1.

4.2.1.3.2 Surface Water

The effects on surface water within the RDG Project Area would be similar to those for Alternative 1.

4.2.1.4 ALTERNATIVE 4 – NO ACTION

4.2.1.4.1 Groundwater

There would be no change in existing conditions within the RDG Project Area.

4.2.1.4.2 Surface Water

The effects on surface water within the RDG Project Area would be similar to those for Alternative 1, though to a much lesser degree.

4.2.2 IMPACTS SUMMARY

Impacts that may occur in all of the alternatives to some degree from contamination of shallow alluvial aquifers include:

- Upward migration of poor quality water from the Birds Nest and Douglas Creek aquifers and/or oil and gas reservoir stimulation fluids (hydraulic fracturing and acidizing fluids) materials along induced or natural fractures.
- Downward migration of drilling fluids from unlined pits to shallow alluvial aquifers.

4.2.3 MITIGATION

Drill pads and facility sites should be designed and constructed to prevent overland flow of water from entering or leaving the sites. This could be accomplished through the use of berms, terraces, and grading to form depressions. Stormwater would be diverted around sites. Any stormwater on disturbed sites would be prevented from flowing off-site, thereby reducing pollution potential.

Roads would be designed to divert stormwater runoff and reduce erosion. Proper design and installation of erosion control structures, such as water bars and diversion channels, would be completed.

Spills, leaks, and contaminated soils would be cleaned up, excavated, or treated to prevent pollution to surface or groundwater.

The need to line reserve pits that contain drilling cuttings and fluids would be assessed at the time of the on-site inspection, prior to any surface disturbance.

Impacts to shallow alluvial aquifers would be reduced by avoiding drilling and seismic shothole operations in the 100-year floodplains of Saddletree Draw, Atchees Wash, Asphalt Wash and its tributaries, and Long Draw.

4.2.4 UNAVOIDABLE ADVERSE IMPACTS

Migration of fluids along natural fractures may occur during initial drilling, but upon completion and cementing of surface and production casing of the well, migration of fluids along natural fractures would be mitigated.

4.3 AIR QUALITY AND CLIMATE

This analysis was prepared solely under the requirements of NEPA, in order to assess and disclose reasonably foreseeable impacts to both the public and the decision maker before a ROD

is issued. Due to the preliminary nature of this analysis, it should be considered a reasonable, but conservative upper estimate of predicted impacts. Actual impacts at the time of development (subject to air pollutant emission source permitting) are likely to be less. The air quality impact assessment was based on available engineering data and assumptions, meteorology data, and EPA dispersion modeling procedures. However, where specific data or procedures were not available, reasonable, but conservative assumptions were incorporated.

The Utah Division of Air Quality (UDAQ) is the primary air quality regulatory agency (under their EPA-approved SIP) responsible for maintaining air quality in the area, except for within the exterior boundaries of the Uintah and Ouray Indian Reservation, where EPA maintains regulatory authority. Since the Project Area is entirely within the exterior boundaries of the Uintah and Ouray Reservation, EPA has the ultimate responsibility for reviewing and permitting air pollutant emission sources from the RDG project before it may become operational. Unlike the "reasonable, but conservative" engineering designs used in this NEPA analysis, any pre-construction, EPA air-quality permitting would be based on analysis of specific values available as part of the project's site-specific permit application.

Construction of facilities that would emit pollutants during operation also requires review and permitting by the EPA. Air dispersion modeling may be required to demonstrate compliance with ambient air standards for sources with a potential to emit more than 40 tons per year of a criteria pollutant. Any source with a potential to emit more than 250 tons per year (and certain listed sources with a potential to emit more than 100 tons per year) of a criteria pollutant are considered major sources and would require a Prevention of Significant Deterioration (PSD) pre-construction review and permit. The air quality assessment under these reviews include an estimation of emissions, evaluation of technologies employed to reduce emissions, and an assessment of compliance with the National Ambient Air Quality Standards (NAAQS) and PSD increments.

Any source that emits or has the potential to emit 10 tons per year or more of any hazardous air pollutant is considered a major source and would require a Title V, Part 71 operating permit review and permit. This may include either a case-by-case 112(g) MACT determination if no applicable MACT emission standard has been promulgated or compliance with an applicable MACT emission standard, such as:

- 40 CFR 63 subpart HH, National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities,
- 40 CFR 63 subpart HHH, National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities, and/or
- 40 CFR 63 subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (proposed December 2002).

4.3.1 DISPERSION MODEL

The EPA ISCST3 dispersion model with the PRIME downwash algorithm was used with surface and upper air meteorological data observations between 1991 and 1995. This model was used to predict maximum potential concentrations in the vicinity of assumed well and compressor engine

emission sources, as well as distant mandatory federal PSD Class I areas, for comparison with applicable air quality standards, PSD increments, hazardous air pollutant (HAP) exposures, visibility, and atmospheric deposition impacts (Trinity Consultants 2002).

4.3.2 DIRECT AND INDIRECT EFFECTS

4.3.2.1 ALTERNATIVE 1 – PROPOSED ACTION

No violations of applicable state or federal air quality regulations or standards are expected to occur as a result of direct, indirect, or cumulative gas development-related air pollutant emissions (including construction and operation).

Construction emissions would occur during road and well pad construction, well drilling, and well completion testing. In addition, particulate matter ($PM_{2.5}$ and PM_{10}) concentrations would decrease rapidly beyond the construction area with application of appropriate dust suppressant and/or control measures (see Section 4.3.4, Mitigation). Potential sulfur dioxide (SO_2) emissions would be generated by drilling rigs and other diesel engines used during rig-up, drilling, and completion operations (sulfur being a trace element in diesel fuel). Maximum air pollutant emissions from each well would be temporary (i.e., occurring only during the construction period), would occur in isolation, and would not significantly interact with adjacent well locations. Since construction emissions would be temporary, PSD increments are not applicable.

Air pollutant dispersion modeling was also performed to quantify potential, direct, "reasonable, but conservative" carbon monoxide (CO), NO_2, PM_{10}, and HAP impacts during operation, based on the period of maximum potential emissions. Operation emissions (primarily CO and oxides of nitrogen [NO_x]) would occur due to increased pipeline compression requirements. It is anticipated that 6 compressor stations would be needed, with a total capacity of nearly 1,300 HP (including two new compressor station locations). Since produced natural gas is nearly pure methane and ethane, with little or no liquid hydrocarbons, no significant direct volatile organic compound emissions would occur due to well operations, although well dehydrators would emit small amounts of CO and NO_x.

The maximum direct CO impacts during operation were predicted to be nearly 74 micrograms per cubic meter ($\mu g/m^3$) and 20 $\mu g/m^3$ (1-hour and 8-hour, respectively). When these values are added to the assumed background concentration of 54 $\mu g/m^3$ and 34 $\mu g/m^3$, they become nearly 128 $\mu g/m^3$ (1-hour) and 54 $\mu g/m^3$ (8-hour). This demonstrates compliance with the applicable NAAQS of 40,000 $\mu g/m^3$ (1-hour) and 10,000 $\mu g/m^3$ (8-hour). These predicted maximum short-term concentrations overestimate actual expected total pollutant concentrations because the maximum modeled concentrations are combined with the first maximum measured background concentrations. However, the meteorological conditions that lead to each situation are very different and are not likely to occur at the same location and the same time.

Maximum direct nitrogen dioxide (NO_2) impacts during operations were predicted based on assumed NO_x emissions from reasonably foreseeable well dehydrators and pipeline compressor engines. The maximum potential NO_2 concentrations were determined by multiplying maximum predicted NO_x concentrations by 0.75, in accordance with standard EPA methodology (40 CFR

51, Appendix W, Section 6.2.3). The maximum predicted direct annual NO_2 impact was 0.43 μg/m³, which is less than 1% of the applicable annual PSD Class II increment of 25 μg/m³. When this value is added to the assumed representative background concentration (0.2 μg/m³), the resulting predicted maximum total impact of 0.6 μg/m³ is also well below the applicable NAAQS of 100 μg/m³ (annual).

The air quality technical report completed for the project (Trinity Consultants 2002) modeled PM_{10} concentrations that would result from several proposed emitter units, including compressors and dehydrators. Potential impacts of fugitive dust on PM_{10} concentrations were not modeled. Project applicants would be required to control fugitive dust through application of dust suppressants and/or other appropriate controls. Because of these requirements, it was assumed that fugitive dust would have a negligible impact on air quality and visibility in the Project Area. Potential PM_{10} impacts were projected to be minimal with application of appropriate dust suppressant and/or control measures.

The CAA lists HAPs that could be emitted during project operations: primarily BTEX (benzene, toluene, ethyl benzene, and xylene) from the well dehydrators and formaldehyde from the pipeline compressor engines. Control of these and other HAPs is achieved through compliance with applicable MACT standards.

NESHAP and MACT regulations for Oil and Natural Gas production facilities[1] include ethylene glycol dehydrators and vents, storage vessels with flash emissions and ancillary equipment. Under these provisions, any source that emits or has the potential to emit 10 tons per year or more of any hazardous air pollutant is considered a major source; would require a Title V, Part 71 operating permit review and permit; and must install and operate control equipment to control air emissions as required by this subpart. Under these same provisions, glycol dehydration units emitting less than 0.9 mg/year (one ton per year) benzene are considered 'small,' and the MACT floor identified is no control.

Given the above requirements, the potential to emit for all of the dehydrators and compressor stations in the Project Area was modeled as part of the air quality technical report prepared for this EIS (Trinity Consultants 2002). Total HAPs emissions modeled included benzene, ethylbenzene, toluene, xylenes, formaldehyde and H_2S (hydrogen sulfide). The cumulative total emissions for all project-related sources was projected to be less than one ton per year; total benzene emissions were projected to be less than 0.2 tons per year. The proposed project sources are, therefore, not considered major sources under the above provisions. Additional information on the modeled HAP emissions and projected concentration values is available in the Air Quality Assessment (Trinity Consultants 2002).

Based on the minimal content of hydrogen sulfide (H_2S) found in the natural gas, potential H_2S impacts would be negligible. However, should H_2S be encountered, operations on federal or Indian leases are regulated by Onshore Oil and Gas Order No. 6 (Hydrogen Sulfide Operations). This order requires monitoring of H_2S beginning at levels of 10 ppm at each drilling well or

[1] 40 CFR part 63, subpart HH §63.760(b)(1) through (4); and 40 CFR part 63, subpart A of the General Provisions, effective June 17, 1999

production facility. Should H_2S levels increase, specific drilling and production equipment, along with drilling and public protection plans, would be required.

Air pollutant dispersion modeling was also performed to quantify potential direct "reasonable, but conservative" NO_2 and PM_{10} impacts at the closest mandatory federal PSD Class I areas, as well as potential impacts to visibility and atmospheric deposition. These mandatory federal PSD Class I areas (Arches and Canyonlands National Parks, and the Flat Tops Wilderness Area) are located between 75 miles (120 km) and 103 miles (165 km) from the RDG Project Area. The maximum predicted direct NO_2 and PM_{10} impacts were all <0.01 $\mu g/m^3$, well below all applicable PSD Class I increments.

This comparison is not a regulatory PSD Increment Consumption Analysis, but an assessment indicating that the increment would not be exceeded by the direct project emission sources. At the time of a pre-construction air quality permit application, the applicable air quality regulatory agencies may require a much more detailed PSD Increment Consumption Analysis.

The maximum predicted direct total nitrogen deposition value was <0.001 kg/ha-hr in all three mandatory federal PSD Class I areas. The USFS has identified 3.0 kg/ha-hr total nitrogen deposition as their "green line" value, which "predicts, with a very high degree of certainty, that no Air Quality Related Values (AQRVs) will be adversely affected" (Fox et al. 1989).

Ned Wilson Lake in the Flat Tops Wilderness Area, for which the most recent and complete data have been collected, was identified as being sensitive to atmospheric deposition (personal communication with M. Schmidt, FS, on October 16, 2001). The USFS, Region 2 (2000), has also identified the following "Limit of Acceptable Change" regarding potential changes in lake chemistry: no more than a 10% change in acid neutralizing capacity (ANC) for those water bodies where the existing ANC is at or above 25 microequivalents per liter (μeq/L). The maximum predicted direct ANC change was <0.01%, well below the 10% change threshold.

Since the Alternative 1 (Proposed Action) emissions sources constitute several small sources spread out over a very large area, discrete visible plumes are not likely to impact the mandatory federal PSD Class I areas, but the potential for cumulative visibility impacts (increased regional haze) is a concern. Potential changes to regional haze are calculated in terms of a perceptible "just noticeable change" (1.0 deciview) in visibility when compared to background conditions.

A 1.0 deciview change is considered potentially significant as described in the EPA Regional Haze Regulations (40 CFR 51.300 et seq.), and originally presented in Pitchford and Malm (1994). A 1.0 deciview change is defined as approximately a 10% change in the extinction coefficient (corresponding to a 2–5% change in contrast, for a "black target" against a clear sky, at the most optically sensitive distance from an observer), which is a small but noticeable change in haziness under most circumstances when viewing scenes in mandatory federal Class I areas.

It should be noted that a 1.0 deciview change is not a "just noticeable change" in all cases for all scenes. Visibility changes less than 1.0 deciview may be perceptible in some cases, especially where the scene being viewed is highly sensitive to small amounts of pollution. Under other view-specific conditions, such as where the sight path to a scenic feature is less than the

maximum visual range, a change greater than 1.0 deciview might be required to be a "just noticeable change."

However, this NEPA analysis is not designed to predict specific visibility impacts for views in specific mandatory federal PSD Class I areas based on specific project designs, but to characterize reasonably foreseeable visibility conditions that are representative of a fairly broad geographic region, based on "reasonable, but conservative" emission source assumptions. This approach is consistent with both the nature of regional haze and the requirements of NEPA. At the time of a pre-construction air quality permit application, the applicable air quality regulatory agency may require a much more detailed visibility impact analysis. Factors such as the magnitude of deciview change, frequency, time of the year, and the meteorological conditions during times when predicted visibility impacts are above the 1.0 deciview threshold (as well as inherent conservatism in the modeling analyses) should all be considered when assessing the significance of predicted impacts.

The USFS, NPS, and the USFWS, published their "Final FLAG Phase I Report" (FLAG 2000), providing "a consistent and predictable process" for assessing the impacts of new and existing sources on AQRVs including visibility. For example, the Final FLAG Phase I Report states, "a cumulative effects analysis of new growth (defined as all PSD increment-consuming sources) on visibility impairment should be performed," and further, "if the visibility impairment from the Proposed Action, in combination with cumulative new source growth, is less than a change in extinction of 10% [1.0 deciview] for all time periods, the Federal Land Managers (FLMs) will not likely object to the Proposed Action."

Although the FLAG procedures were primarily designed to provide analysis guidance to Clean Air Act PSD permit applicants, the following Table 4-1 uses the "Final FLAG Phase I Report" procedures for this NEPA analysis. In addition, the following modeling analysis is cumulative, including both existing and potential emission sources.

Table 4-1. Cumulative Visibility Impact in "Deciview Change" (Alternative 1)

Mandatory Federal PSD Class I Area	Winter	Spring	Summer	Fall	Maximum Deciview Change Threshold
Arches National Park	0.36	0.08	0.14	0.10	1.0
Canyonlands National Park	0.28	0.07	0.05	0.09	1.0
Flat Tops Wilderness Area	0.07	0.07	0.13	0.10	1.0

Source: Trinity Consultants 2002.

When reviewing the predicted Alternative 1 (Proposed Action) impacts, it is important to understand the "reasonable, but conservative" assumptions made regarding potential resource development. In developing this analysis, there is uncertainty regarding ultimate development

(i.e., number of wells, equipment to be used, specific locations). The analysis was also based on a reasonably foreseeable development scenario, including several conservative assumptions:

- Maximum measured and/or estimated background criteria air pollutant concentrations were assumed to occur at all locations in the region throughout the life of the project (LOP).
- All potential natural gas wells (nearly 423) were assumed to be fully operational (no dry holes) and remain operating (no shut-ins) throughout the LOP.
- The potential pipeline compression engines (nearly 740 HP additional) were assumed to operate continuously throughout the LOP (no phased increases or reductions). In reality, compression equipment would be added or removed incrementally as required by the well field operation.
- All emissions sources were assumed to operate at their reasonably foreseeable emission rates simultaneously throughout the LOP. Given the number of sources included in this analysis, the probability of such a scenario actually occurring over an entire year (or even 24-hours) is small. While this assumption is typically used in modeling analyses, the resulting predicted impacts will be overstated.
- Total predicted short-term air pollutant impact concentrations were assumed to be the sum of the first maximum background concentration, plus the maximum modeled concentrations, which actually occur under very different meteorological conditions and are not likely to coincide.
- The HAP analyses assumed all equipment would operate simultaneously at the maximum emission levels continuously throughout the LOP.

Given these numerous reasonable, but conservative analysis assumptions, which may actually compound one another, the predicted impacts represent an upper estimate of potential air quality impacts, which are unlikely to actually be reached. However, even applying these reasonable, but conservative analysis assumptions, all predicted impacts are below applicable regulatory limits, and the scientific evidence is not compelling that reasonably foreseeable significant adverse impacts would occur.

4.3.2.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Since Alternative 2 – Additional Wildlife Considerations would have the same number of natural gas wells developed as under Alternative 1, potential air quality impacts would be the same as those reported in Section 4.3.2.1, above.

4.3.2.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Since Alternative 3 would have fewer natural gas wells developed than under Alternative 1, the potential air quality impacts would be less than those reported in Section 4.3.2.1 above.

4.3.2.4 ALTERNATIVE 4 – NO ACTION

As described in Section 4.3.2.1 above, the EPA dispersion model and algorithm were also used to predict maximum potential air quality impacts from existing emission sources, which would continue to operate under the No Action Alternative. These existing sources include nearly 103 well dehydrators and 4 existing pipeline compression engines (nearly 560 HP total). The following analysis results identify predicted air pollutant concentrations in the vicinity of existing wells and compressor engines, as well as distant, mandatory Federal PSD Class I areas, for comparison with applicable air quality standards, PSD increments, HAP exposures, visibility standards, and atmospheric deposition impacts (Trinity Consultants 2002).

- Since these are existing sources, there would be no construction-related air quality impacts.
- The maximum CO impacts from existing source operation are predicted to be nearly 71 μg/m³ (1-hour) and 20 μg/m³ (8-hour). When these values are added to the assumed background concentration of 54 μg/m³ and 34 μg/m³, respectively, they become nearly 125 μg/m³ (1-hour) and 54 μg/m³ (8-hour), demonstrating compliance with the applicable NAAQS of 40,000 μg/m³ (1-hour) and 10,000 μg/m³ (8-hour) for CO.
- The maximum annual NO_2 impact was 1.95 μg/m³, which is 8% of the applicable annual PSD Class II increment of 25 μg/m³. When this value is added to the assumed representative background concentration (0.2 μg/m³), the resulting predicted maximum total impact of 2.2 μg/m³ is also well below the applicable NAAQS of 100 μg/m³ (annual) for NO_2.
- The maximum predicted NO_2 and PM_{10} impacts from existing source operations at the closest mandatory federal PSD Class I areas were all <0.01 μg/m³, well below all applicable PSD Class I increments. As stated previously, all NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.
- Total HAP emissions modeled included benzene, ethylbenzene, toluene, xylenes, formaldehyde, and H_2S. The cumulative total emissions for existing sources was projected to be less than 0.5 tons per year; total benzene emissions were projected to be less than 0.1 tons per year. Existing sources are, therefore, not considered major sources under the provisions outlined in the Clean Air Act Section 112(b) and 40 CFR part 63. Additional information on the modeled HAP emissions and projected concentration values is available in the Air Quality Assessment (Trinity Consultants 2002).
- The maximum predicted total NO_x deposition value from existing source operation was <0.001 kg/ha-hr in all three mandatory federal PSD Class I areas—well below the 3.0 kg/ha-hr total nitrogen deposition threshold.
- The maximum predicted ANC change from existing source operation at Ned Wilson Lake was <0.01%—well below the 10% change threshold.
- As described in Section 4.3.2.1, the cumulative visibility modeling analysis, including both existing and potential emission sources, demonstrated that no potential visibility impacts would exceed the 1.0 deciview (just noticeable change) threshold for any season at any nearby mandatory federal PSD Class I area.

When reviewing the predicted Alternative 4 impacts, it is important to understand the "reasonable, but conservative" assumptions made regarding existing resource development. The analysis was based on several conservative assumptions, including:

- Maximum measured and/or estimated background criteria air pollutant concentrations were assumed to occur at all locations in the region throughout the LOP.
- All existing natural gas wells (nearly 103) were assumed to remain fully operational (no shut-ins) throughout the LOP.
- The existing pipeline compression engines (nearly 560 HP) were assumed to operate continuously throughout the LOP (no reductions).
- All existing emissions sources were assumed to operate at their reasonably foreseeable emission rates simultaneously throughout the LOP. Given the number of sources included in this analysis, the probability of such a scenario actually occurring over an entire year (or even 24-hours) is small. While this assumption is typically used in modeling analyses, the resulting predicted impacts will be overstated.
- Total predicted short-term air pollutant impact concentrations were assumed to be the sum of the first maximum background concentration, plus the maximum modeled concentrations, which actually occur under very different meteorological conditions and are not likely to coincide.
- The HAP analyses assumed all existing equipment would continue to operate simultaneously at the assumed emission levels continuously throughout the LOP.

4.3.3 IMPACTS SUMMARY

No significant, adverse, direct or indirect impacts to air quality are anticipated from implementation of the Proposed Action or alternatives. Based on a separate assessment predicting potential near-field air quality impacts (Trinity Consultants 2002), localized, short-term increases in CO, NO_2 and PM_{10} concentrations would occur, but maximum concentrations would be well below applicable state and federal criteria. Similarly, at the maximum assumed Alternative 1 (Proposed Action) emission rates, predicted HAP concentrations would be well below the identified NESHAP/MACT threshold of 10 tons per year.

4.3.4 MITIGATION

Roads and well locations constructed on soils susceptible to wind erosion could be appropriately surfaced to reduce the amount of fugitive dust generated by traffic or other activities, and dust inhibitors (i.e., surfacing materials, non-saline chemical surfactants, water, etc.) could be used as necessary on unpaved collector, local, and resource roads that present a fugitive dust problem. However, no specific quarry or storage sites for surfacing material have been identified within the Project Area. Surfacing material would be stored on previously disturbed sites. Potential new quarry sites would require a separate environmental analysis that would tier to this EIS. To further reduce fugitive dust, project operators could establish and enforce speed limits (15-30 mph) on all project-required roads in and adjacent to the RDG Project Area.

4.3.5 UNAVOIDABLE ADVERSE IMPACTS

Some increase in air pollutant emissions would occur as a result of the Proposed Action and alternatives; however, based on the reasonable, but conservative modeling assumptions, these impacts are predicted to be well below applicable significance thresholds in all cases.

4.4 SOILS/WATERSHED/FLOODPLAINS

4.4.1 DIRECT AND INDIRECT EFFECTS

4.4.1.1 ALTERNATIVE 1 – PROPOSED ACTION

The Proposed Action would impact approximately 1,222 acres of soil resources, of which 355 acres would be temporary, short-term impacts as a result of construction. Impacts include the removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to wind and water erosion. Blading or excavation on slopes to achieve desired grades could result in slope steepening of exposed soils on cut and fill slopes and on steeper slopes. Potential slope failure could occur.

Typically, well pad construction results in a cut slope, a level well pad, and a fill slope. Cut slopes would be steeper than the surrounding slope, increasing sediment yields. The sediment from the cut slopes would be deposited on the well pad site. The fill slopes would have an increase in sediment yields and the sediment would be delivered to the area adjacent to the fill slopes.

There would be an increased susceptibility to erosion in newly disturbed areas. Removal of vegetation would increase the potential for channelized runoff and accelerated erosion to occur, with a corresponding increase in erosion where disturbance occurs on steeper slopes. Erosion would result in the increased formation of rills and gullies. Where well pad facilities are located in active drainages and protective streambank vegetation is removed, there would be an increase in the vulnerability of the streambanks to lateral widening, resulting in an increase in sediment loads in the particular drainage. As sediment loads are increased in a drainage, the potential for deposition, braiding, and lateral bank widening are increased, which can lead to a cycle of repeating deposition, braiding, and lateral bank widening further downstream. Well pad facilities located within the active drainage would also have an increased pollution risk from facility overtopping or rupture since the storm flow velocities are quite high within the active drainage. If well pads are placed on the terrace within the 100-year floodplain, there would be a short-term period during the drilling phase of construction in which the reserve pit could be flooded and the fluids within the pit could contaminate the stormwaters. Since the velocity of flood events is expected to be quite low on these terraces, the risk of pollution from overtopping or rupture and resultant spillage is expected to be minimal on well pads in a production mode.

Additional roads may indirectly impact OHV access and use in those areas. OHV impacts to soil resources due to increased access would be minimal; localized areas of use may experience additional soil compaction and surface abrasion.

Construction of well pads and roads on slopes greater than 40% generally require extensive cuts and fills, which can result in:

- a large scar with greater erosion potential;
- greater potential to lose, mix, or bury critical topsoil during construction and reclamation, which would lower long-term soil productivity;
- greater difficulty in stabilizing cut slopes via revegetation (most of these soils on these slopes have greater than 35% coarse fragments, which greatly lowers the reclamation potential); and
- greater difficulty in returning disturbed slopes to their preconstruction contour during final reclamation.

Increased rilling and gullying can occur on the slope face from water running off roads and well pads onto the adjacent steep slopes. Soils in the RDG Project Area on these types of slopes are grouped mostly in the hydrologic Group D, which has the lowest infiltration/highest runoff value. These same soils also have a moderate or high hazard of water erosion, which would be further aggravated by increased runoff from roads/well pads.

Potential roads and well pads were not officially sited on a map, as the applicant has proposed to determine final road and well pad placement at the time of the application. Therefore, the following assumptions were made to calculate soil losses from the Proposed Action of drilling 423 wells.

- Sediment yields were calculated using the average value of the background range of values (1.5 to 3.0 tons/acre/year), which would be 2.2 tons/acre/year (NPS 1979). Erosion rates were estimated to be 3 times the average background rate of 2.2 tons/acre/year for the first year following disturbance, for a net increase of 4.4 tons/acre/year, and would be double the background rate thereafter for the life of the facility, for a net increase of 2.2 tons/acre/year. These figures are based on professional judgment and experience with soil erosion in the RDG Project Area (BLM 1999a). Current erosion modeling techniques (RUSLE, WEPP, Crossdrain) require site-specific data such as road length, soil texture, length between drainage dips, etc., which were not available since the site specific details of road and pad location are proposed to be determined at the field on-site.
- Disturbance per developed well would be 1.80 acres for the well pad and 1.09 acres for each access road to the well pad. Total new disturbance per well would be 2.89 acres. The well pad area would be reduced by 0.84 acres following completion operations, resulting in approximately 2.05 acres of long-term disturbance per well.
- Field observations from past reclamation efforts in the RDG Project Area indicate that stabilization of disturbed areas usually takes an average of 4 years following reclamation, with the time spans a little longer on the rockier, shallower soils on the hill slopes and shorter on the finer textured soils in the valley bottoms. Nonetheless, a four-year time span following reclamation/re-seeding was used in the sediment yield calculations.

Therefore, based on these assumptions, each well development would contribute an additional 12.71 tons/year of soil loss the first year following disturbance (4.4 tons/acre × 2.89 acres). Each well development would create an additional 6.36 tons/acre for the second, third, fourth and fifth

years, as 0.84 acres of the pad are reclaimed and re-seeded (2.2 tons/acre × 2.89 acres). Each well development would create an additional 4.51 tons/year from the unreclaimed portions of the well and access road for the remaining 16 years of the expected 20-year life of the development (2.05 acres × 2.2 tons/acre).

At the end of 20 years, the well and access road would be reclaimed, and an additional 4.51 tons/year of sediment would continue to be produced for 4 years after reclamation, until the disturbed sites are stabilized (2.05 acres × 2.2 tons/acre).

Total produced sediment per well is calculated below:

Year 1	12.71 tons	
Year 2 through Year 5	6.36 tons/year @ 4 years =	25.44
Year 6 through Year 20	4.51 tons/year @ 15 years =	67.65
Year 21 through Year 24	4.51 tons/year @ 4 years =	18.04

Total produced sediment for each well development for a span of 24 years would be 124 tons. With 423 wells proposed for development, approximately 52,367 tons of sediment would be produced over the life of the project.

As noted in Section 3.4.2, the sediment delivery efficiency is poor in the RDG Project Area. The majority of the sediment is expected to be deposited onto adjacent undisturbed areas, with only approximately 20% actually being delivered to drainages within the watershed. Sediment produced from roads is much more efficiently delivered to drainages, depending upon the location of the road. Of the estimated sediment yield production of 52,367 tons, approximately 20% of this amount (or 10,473 tons) would be delivered to the network of ephemeral drainages. Once delivered to an ephemeral drainage, the sediment would be available for transport. Over time, this sediment is expected to be delivered to the White River. An additional, but unknown amount of sediment would also be generated from road-produced bank erosion to be eventually delivered to the White River.

There would be additional erosion occurring where water is collected along a road and then turned off the road into adjacent drainages. Past experience in the RDG Project Area has shown that where roads are located within 20 feet of a drainage and water is turned off a road towards the drainage, headcutting occurs back into the drainage bank towards the road. This is because most of the drainages have vertical banks, the gradient between the roadbed elevation and the drainage bed is quite steep, and there is little perennial vegetation to decrease overland flows. In some instances the headcut is eroding into the roadbed, and working up the borrow ditch. The quantity of erosion is difficult to estimate, as each water turnout site would have varying parameters, such as depth of the drainage, area of water collection, etc., that can only be determined in the field. The expected bank erosion would result in localized areas of deposition in the drainage; however, the total amount of deposition is not expected to result in any extensive aggradation, braiding, or lateral stream bank widening, in any one watershed.

Gathering pipelines associated with the well development would be made of steel and would all be surface lines. Experience in the RDG Project Area with surface lines has shown that there are typically minor amounts of surface disturbance involved with surface line installation (BLM

1999a). Installation/construction of surface lines in the RDG Project Area are not expected to cause any measurable increase in erosion/sediment yields.

4.4.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Under this alternative, there would be no surface-disturbing activities on slopes greater than 40%. As under the Proposed Action, this alternative would impact approximately 1,222 acres of soil resources, of which 355 acres would be temporary, short-term impacts as a result of construction.

Impacts to the soils/watershed resource would generally be the same as described in the Proposed Action. The assumptions used to calculate soil losses are the same as described in the Proposed Action, except that since there would be no surface-disturbing activities on slopes greater than 40%, the lower value of the range of background erosion rate was used: 1.5 tons/acre/year.

Erosion rates would be three times the background rate of 1.5 tons/acre/year for the first year following disturbance, for a net increase of 3.0 tons/acre/year, and would be double the background rate thereafter for the life of the facility, for a net increase of 1.5 tons/acre/year. These figures are based on professional judgment and experience with soil erosion in the RDG Project Area. Current erosion modeling techniques (RUSLE, WEPP, Crossdrain) require site-specific data such as road length, soil texture, length between drainage dips, etc., which were not available, since the site-specific details of road and pad location are proposed to be determined at the field on-site.

Disturbance per developed well would be 1.80 acres for the well pad and 1.09 acres for each access road to the well pad. Total new disturbance per well would be 2.89 acres. The well pad area of 1.80 acres would be reduced by 0.84 acres following completion operations, resulting in approximately 2.05 acres of long-term disturbance per well.

Field observations from past reclamation efforts in the RDG Project Area indicate that stabilization of disturbed areas usually takes an average of 4 years following reclamation, with the time spans a little longer on the rockier, shallower soils on the hill slopes and shorter on the finer textured soils in the valley bottoms. Therefore a four-year time span following reclamation/re-seeding was used in the sediment yield calculations.

Each well development would contribute an additional 8.67 tons/year of soil loss the first year following disturbance (3.0 tons/acre × 2.89 acres). Each well development would create an additional 4.34 tons/year for the second, third, fourth, and fifth years, as 0.84 acres of the pad are reclaimed and re-seeded (2.89 acres × 1.5 tons/acre). Each well development would create an additional 3.08 tons/year from the unreclaimed portions of the well and access road for the remaining 16 years of the expected 20-year life of the well (2.05 acres × 1.5 tons/acre).

At the end of 20 years, the well and access road would be reclaimed, and an additional 3.08 tons of sediment/year would continue to be produced for 4 years after reclamation, until the disturbed sites are stabilized (2.05 acres × 1.5 tons/acre).

Total produced sediment for each well development for a span of 24 years is calculated below.

Year 1	8.67 tons	
Year 2 through Year 5	4.34 tons/year @ 4 years =	17.28
Year 6 through Year 20	3.08 tons/year @ 15 years =	45.09
Year 21 through Year 24	3.08 tons/year @ 4 years =	12.24

Total produced sediment per well is 84.55 tons. With 423 wells proposed for development, approximately 35,765 tons of sediment would be produced.

As noted in Section 3.4.2, the sediment delivery efficiency is poor (outside of drainages) in the RDG Project Area. The majority of the sediment is expected to be deposited onto adjacent undisturbed areas with approximately only 20% (7,153 tons) actually being delivered to drainages.

There would be additional erosion occurring where water is collected along a road and then turned off the road into adjacent drainages. Past experience in the RDG Project Area has shown where roads are located within 20 feet of a drainage, and water is turned off a road towards the drainage, then headcutting back into the drainage bank towards the road occurs. This is because most of the drainages have vertical banks, the gradient between the roadbed elevation and the drainage bed is quite steep, and there is little perennial vegetation to decrease overland flows. In some instances the headcut is eroding into the roadbed and working up the borrow ditch. The quantity of erosion is difficult to estimate, as each water turnout site will have varying parameters, such as depth of the drainage, area of water collection, etc., that can only be determined in the field. The expected bank erosion would result in localized areas of deposition in the drainage, however, the total amount of deposition is not expected to result in any extensive aggradation, braiding, or lateral stream bank widening, in any one watershed.

Gathering pipelines associated with the well development would be made of steel and would all be surface lines. Experience in the RDG Project Area with surface lines has shown that there are typically minor amounts of surface disturbance involved with surface line installation (BLM 1999a). Installation/construction of surface lines in the RDG Project Area are not expected to cause any measurable increase in erosion/sediment yields.

Of the estimated sediment yield production of 35,765 tons, approximately 20% of this amount (or 7,153 tons) would be delivered to the network of ephemeral drainages. Once delivered to an ephemeral drainage, then the sediment would be available for transport. Over time, this sediment is expected to be delivered to the White River. An additional, but unknown amount of sediment would also be generated from road produced bank erosion, eventually to be delivered to the White River.

OHV impacts to soils, if any, would be similar to Alternative 1.

4.4.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

The impacts to soil resources would be similar to those described for Alternative 2, but the number of wells developed under this alternative would be reduced to 373 in order to protect

wilderness characteristics within the RDG Project Area. This alternative would impact approximately 1,078 acres of soil resources, of which 313 acres would be temporary, short-term impacts as a result of construction. There would be no surface-disturbing activities on slopes greater than 40%, and there would be additional protection measures for mule deer winter range.

The calculations and assumptions used to derive the total sediment produced per well are the same as for Alternative 2 and would result in approximately 84.55 tons of sediment/well for an assumed well lifetime of 24 years. With 373 wells proposed for development under this alternative, approximately 31,537 tons of sediment would be produced.

Of the estimated sediment yield production of 31,537 tons, approximately 20% of this amount (or 6,307 tons) would be delivered to the network of ephemeral drainages. Once delivered to an ephemeral drainage, then the sediment would be available for transport. Over time, this sediment is expected to be delivered to the White River. An additional, but unknown amount of sediment would also be generated from road-produced bank erosion, eventually to be delivered to the White River.

OHV impacts to soils, if any, would be similar to but less than Alternative 1.

4.4.1.4 ALTERNATIVE 4 – NO ACTION

Under this alternative, 2 to 5 wells could be drilled per year in this area. In addition, roads could be constructed on federal lands to access state and private leases. Impacts to watershed/soils under this alternative would be similar to those listed under the Proposed Action, except that the total amount of soil disturbance and erosional impacts would be proportionally less.

Using the same assumptions listed in Alternative 1, each producing well would produce 123 tons of sediment over a 24-year span. With 2-5 wells drilled each year for a 20-year period, there would be a range of approximately 4,952 to 12,380 tons of sediment produced each year. With a sediment delivery efficiency of 20%, approximately 990 to 2,476 tons of sediment would be available for transport and, over time, delivered to the White River. An additional, but unknown amount of sediment would also be generated from road-produced bank erosion, eventually to be delivered to the White River.

4.4.2 IMPACTS SUMMARY

4.4.2.1 ALTERNATIVE 1 – PROPOSED ACTION

Impacts to soil resources from the Proposed Action are expected to be:

- the removal of vegetation;
- soil exposure and compaction;
- loss of soil productivity;
- increased susceptibility of soil to wind and water erosion;
- increased sediment yields;

- increased roadbank erosion;
- localized headcutting in drainage channels from adjacent roads; and
- increased bank erosion from well pads if placed in the active channel of drainages.

4.4.2.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Same as Alternative 1.

4.4.2.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Same as Alternative 1.

4.4.2.4 ALTERNATIVE 4 – NO ACTION

Same as Alternative 1.

4.4.3 MITIGATION

4.4.3.1 ALTERNATIVE 1 – PROPOSED ACTION

There are several measures that could be used to reduce expected increases in sediment yields and to lessen or negate impacts caused to soil, watershed, and floodplain resources. These are as follows:

- Avoiding surface disturbing activities on slopes greater than 60% would reduce excessive rilling and gullying.
- Avoiding well pad construction on slopes greater than 40% would reduce slope failure and scarring.
- Avoiding, to the fullest extent possible, road construction on slopes between 40% and 60% would also mitigate impacts. If it is not feasible to avoid these slopes, then the applicant should provide to the AO an erosion control plan, a road maintenance plan, and an engineered drawing of the proposed road. Approval from the AO would be required for all proposed roads traversing slopes between 40% and 60%.
- All roads should be constructed to Gold Book (Fourth Edition) standards.
- Well pads shall not be located within active drainages.
- All wells placed on the terrace adjacent to the active drainage of designated 100-year floodplains should have a closed system.
- To the fullest extent possible, access roads proposed in valley/drainage bottoms should be sited on the toe of the adjacent slope to the valley bottom. Roads should have appropriate energy dissipaters (e.g., water bars, silt fences) where water leaves the road and is routed towards an adjacent drainage.
- Well pads adjacent to drainages should be bermed to prevent runoff from entering the drainage.

- As conditions dictate, and as determined by the AO, diversion ditches should be constructed around the pad.
- Where diversion ditches are constructed to reroute drainages around well pads, then the ditches should be designed to return the diverted water back to the original channel. If not feasible to return diverted water back to its original channel, then the water should be diverted to the nearest channel, with energy dissipating devices installed to prevent channel degradation.

4.4.3.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Several measures could be used to reduce expected increases in sediment yields and to lessen or negate impacts caused to soil, watershed, and floodplain resources under this alternative. These are as follows:

- Avoiding well pad construction on slopes greater than 40% would reduce slope failure and scarring.
- All roads should be constructed to Gold Book (Fourth Edition) standards.
- Well pads shall not be located within active drainages, which would reduce the potential for large-scale bank erosion events and the possibility of contaminants entering the drainage system.
- All wells placed on the terrace adjacent to the active drainage of designated 100-year floodplains should have a closed system, which would reduce the possibility of contaminants entering the drainage system.
- To the fullest extent possible, access roads proposed in valley/drainage bottoms should be sited on the toe of the adjacent slope to the valley bottom. Roads should have appropriate energy dissipaters (e.g., water bars, silt fences) where water leaves the road and is routed towards an adjacent drainage. This would reduce the impact of road generated bank erosion.
- Well pads adjacent to drainages should be bermed to prevent runoff from entering the drainage, which would reduce the impact of well pad generated bank erosion and reduce the possibility of pollutants entering the drainages.
- As conditions dictate, and as determined by the AO, diversion ditches should be constructed around the pad.
- Where diversion ditches are constructed to reroute drainages around well pads, then the ditches should be designed to return the diverted water back to the original channel. If it is not feasible to return diverted water back to its original channel, then the water should be diverted to the nearest channel, with energy dissipating devices installed to prevent channel degradation. This would reduce the possibility of well pad generated bank erosion.

4.4.3.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Same as described for Alternative 2.

4.4.3.4 ALTERNATIVE 4 – NO ACTION

Current mitigation measures would continue.

4.4.4 UNAVOIDABLE ADVERSE IMPACTS

Under Alternative 1, an estimated 10,473 tons of sediment are expected to be eventually delivered to the White River, (compared to current, annual sediment load of 2,200,000 tons/year). This additional loading would result in a slight decline in water quality. Alternatives 2, 3, and 4 would deliver 7,153 tons, 6,307 tons, and 2,470 tons of sediment over time to the White River, respectively.

4.5 VEGETATION

4.5.1 DIRECT AND INDIRECT IMPACTS

Direct effects to vegetation would result from the disturbance or removal of vegetation for the purpose of constructing of well pads and/or ancillary facilities. Duration of the effects would vary from short- to long-term. Short-term effects would occur in areas where previously vegetated locations are disturbed, but reclaimed within 1 to 3 years of the time of disturbance. Long-term effects would occur where well pads, roads, or other semi-permanent facilities displace previously vegetated areas for as long as the project-related facilities are in operation.

Indirect effects to vegetation would occur as a result of activities other than direct disturbance or removal of vegetation. Sources of indirect effects would include the introduction or spread of noxious weeds; accidental spills of fuels, lubricants, and/or other materials; increased OHV access; fugitive dust; and increases in the incidence of wildfire.

4.5.1.1 ALTERNATIVE 1 – PROPOSED ACTION

The direct impacts to vegetation communities would consist of 1,222 disturbed acres. Short-term vegetation loss would impact 355 acres, while long-term vegetation loss would impact the remaining approximately 867 acres. Though the proposed well locations are not clearly defined, the majority of vegetation disturbance would likely occur within the sagebrush and pinyon-juniper vegetation communities.

The sagebrush and pinyon-juniper vegetation communities found throughout the RDG Project Area are considered to be in a mature seral stage in terms of plant composition and production. Reclaiming/Re-seeding after removal of vegetation would result in a newly established community in a young seral stage. The young seral stage is characterized by a higher percentage of pioneer weedy species. Over time, the disturbed sites would succeed through the different seral stages until the area reaches seral maturity. The estimated time intervals for recovering from a young to the pre-project mature seral stage are 30 to 40 years for the sagebrush vegetation community, and 75 to 150 years for the pinyon-juniper vegetation community.

Due to the poor soil productivity and low annual precipitation within the RDG Project Area, initial re-seeding attempts may fail. Should this occur, undesirable plants and noxious weeds would have greater a greater potential to invade and dominate the disturbed areas. These conditions could increase the time required for site stabilization, and a decrease in long-term vegetation diversity would likely result.

4.5.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Under this alternative, there would be 423 wells drilled. Direct impacts to vegetation would be similar to those listed for Alternative 1, with the same number of acres being impacted. Approximately 1,222 acres would be directly impacted under this alternative. Of the 1,222 acres disturbed, approximately 355 acres would be affected by short-term disturbance. Long-term disturbance would affect the remaining 867 acres. The majority of vegetation disturbance would likely occur within the sagebrush and pinyon-juniper vegetation communities.

Indirect impacts for Alternative 2 would be similar to those described for Alternative 1.

4.5.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Under this alternative, 373 wells would be drilled, with direct impacts to vegetation communities of approximately 1,078 acres. Of the 1,078 acres, 313 acres would be affected by short-term disturbances. Long-term disturbance would affect the remaining 765 acres. The majority of vegetation disturbance would likely occur within the sagebrush and pinyon-juniper vegetation communities.

Indirect impacts for Alternative 3 would be similar to those described for Alternative 1.

4.5.1.4 ALTERNATIVE 4 – NO ACTION

Under this alternative, current land practices would continue. Drilling of 2 to 5 wells per year would be permitted within the RDG Project Area, and roads could be constructed on federal lands to access state and private leases. Drilling 5 wells in one year would produce 14.4 acres of disturbed vegetation. Short-term vegetation loss would impact 4.2 acres, and long-term vegetation loss would impact the remaining 10.2 acres. The majority of vegetation disturbance would likely occur within the sagebrush and pinyon-juniper vegetation communities.

Indirect impacts for Alternative 4 would be similar to those described for Alternative 1.

4.5.2 IMPACTS SUMMARY

Direct and indirect impacts for all 4 alternatives would be similar in nature but varied in the number of acres affected; all 4 alternatives would likely remove some of the sagebrush and pinyon-juniper community types within the RDG Project Area. Alternatives 1 and 2 would impact or disturb approximately 1,222 acres of vegetation (or approximately 1.5% of the RDG Project Area). Alternative 3 would impact 1,078 acres, and Alternative 4 would continue to impact approximately 14 acres each year.

4.5.3 MITIGATION

A variety of mitigation measures can be applied to areas of disturbed vegetation:

- If a re-seeding attempt is unsuccessful, additional seeding would be required until revegetation is successful. Chemical treatment of cheatgrass may be required if density of this species on the sites would limit the success of re-seeding.
- Noxious weed infestations associated with wellsites, well facilities, roads, or ROWs constructed or improved for this project would be treated and controlled by RDG operators, with weed treatment protocols being specified in the pesticide use permit approval process.
- Construction equipment entering BLM lands would be power-washed to eliminate noxious weed seeds.
- For Alternatives 2 and 3, mitigation or enhancement of 1.5 acres would be required for every acre of surface disturbance of browse habitat located inside mule deer crucial winter range. The BLM can require mitigation within the disturbed areas of the proposed site; however, the BLM cannot require mitigation to take place off-site. The RDG operators may volunteer to contribute to off-site mitigation or enhancement in UDWR-identified critical deer winter range.

4.5.4 UNAVOIDABLE ADVERSE EFFECTS

Unavoidable, direct and indirect, adverse effects would occur under each of the 4 alternatives. Under each of the action alternatives, at least 1,078 acres of vegetation communities would be directly disturbed. Under the No Action Alternative, the direct adverse effects would be substantially less, at a maximum of 14.4 acres per year. Acres of disturbance would be greatest for Alternatives 1 and 2 and least for Alternative 4. In addition, the areas disturbed under each alternative would have greater potential for invasion by noxious weeds and would likely require annual monitoring and treatment to prevent the spread of these weeds. Revegetation could potentially take several years.

4.6 RIPARIAN/WETLANDS AREAS

Utah BLM Riparian Policy (UT-93-93) is to maintain and/or improve riparian areas to "Proper Functioning Condition." No new surface disturbing activities are allowed within 100 m (330 feet) of riparian areas unless it can be shown that 1) there are no practical alternatives; 2) all long-term impacts can be fully mitigated; or 3) the activity will benefit or enhance the riparian area.

4.6.1 DIRECT AND INDIRECT EFFECTS

4.6.1.1 ALTERNATIVE 1 – PROPOSED ACTION

As noted in Section 3.6, the largest riparian area (5.6 acres) is along Bitter Creek where it flows through the RDG Project Area (see Map 2-5). However, as part of the Proposed Action, no

well/road development would occur in the Bitter Creek 100-year floodplain, resulting in no disturbances to the riparian area along Bitter Creek. Remaining would be 3.5 acres of wetland that could potentially be disturbed by the Proposed Action.

Since the water sources of these other two wetland areas (1.1 and 2.4 acres) are from flowing wells (initially drilled for natural gas), it is unlikely that any wells/roads would be situated at the wellsites or near enough to cause any adverse impacts to the flowing wells themselves. Disturbance (removal or filling) of riparian vegetation for well pad/road facilities in these areas would result in the long-term loss of 3.5 acres of riparian vegetation, allowing potential opportunities for noxious weeds and undesirable plants, especially tamarisk, to invade when reclamation is implemented. Invasion of noxious weeds and undesirable plants would decrease the available area for the more desirable wetland species, resulting in an overall decrease in the diversity of native vegetation and a decrease in the functional value of the wetland area by wildlife species that use these areas as important habitat.

4.6.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Under Alternative 2, the wetland areas that are discussed in Section 4.6.1.1 as having the potential to be impacted would not be affected by the proposed project. Instead, there would be no surface disturbing activities in these areas. Therefore, direct impacts to the wetlands would not occur. However, indirect impacts, such as sedimentation and dewatering of artesian well flows, could occur if wells were to be developed within close proximity to the delineated wetlands.

4.6.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Impacts and mitigation to riparian and wetland areas that would occur under Alternative 3 would be identical to those listed under Alternative 2, since enhanced protection for mule deer would only involve seasonal restrictions.

4.6.1.4 ALTERNATIVE 4 – NO ACTION

Under this alternative, 2 to 5 wells per year could be drilled in this area, and additional roads could be constructed on federal lands to access state and private leases. There would be 9.09 acres of riparian habitat that could potentially be disturbed by the Proposed Action, including 5.6 acres along Bitter Creek.

Disturbance of riparian vegetation along Bitter Creek from the construction of well pads and/or roads would result in the long-term loss of riparian vegetation and a greater potential for sediment to be directly delivered to Bitter Creek itself, resulting in an unquantifiable decrease in water quality. Removal of vegetation along the stream banks could lead to bank failure and widening, resulting in increased sediment loads in Bitter Creek. Since flows in Bitter Creek average only 3-5 cubic feet per second (cfs), any large increases in sediment loads would most likely lead to downstream aggradation, braiding, and lateral bank widening, which would in result in a new cycle of aggradation, braiding, and stream bank erosion until a new sediment

equilibrium is established. This cycle of stream degradation would result in a decline in water quality in Bitter Creek.

Since the water source of the wetland areas downstream of the flowing wells are old natural gas wells, it is unlikely that any wells/roads would be situated at or near enough to cause any adverse impacts to the flowing wells themselves.

Disturbance of riparian vegetation for well pad/road facilities could result in the long-term loss of riparian vegetation on 9.09 acres and increase the potential opportunities for noxious/undesirable weeds, especially tamarisk, to invade when reclamation is implemented. Invasion of noxious/undesirable weeds would decrease the available area for the more desirable riparian plants, resulting in an overall decrease in the diversity of native vegetation and a decrease in the suitability of the riparian area by native animal species that depend on riparian diversity and structure for habitat.

4.6.2 IMPACTS SUMMARY

4.6.2.1 ALTERNATIVE 1 – PROPOSED ACTION

Impacts to riparian and wetland areas would include:

- a loss of 3.5 acres of wetlands area vegetation;
- an increase in undesirable species, including noxious weeds; and
- a decrease in the vegetation diversity of these two areas.

4.6.2.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Indirect decline in water quality from sedimentation from nearby roads/well pads. Loss of water from the artesian well from adjacent drilling.

4.6.2.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Same as Alternative 2.

4.6.2.4 ALTERNATIVE 4 – NO ACTION

The affects on riparian/wetland habitat would include:

- increased bank erosion and resulting sedimentation for Bitter Creek;
- a short-term loss of 9.09 acres of riparian/wetland habitat;
- a long-term decline in vegetation diversity on 9.09 acres; and
- an increase in undesirable species, including noxious weed species.

4.6.3 MITIGATION

4.6.3.1 ALTERNATIVE 1 – PROPOSED ACTION

Impacts to riparian/wetland vegetation could be completely mitigated by avoiding surface-disturbing activities within 100 m of all delineated riparian/wetland areas from the 1993/1994 BLM riparian inventory/classification.

4.6.3.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Same as Alternative 1.

4.6.3.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Same as Alternative 1.

4.6.3.4 ALTERNATIVE 4 – NO ACTION

Current mitigation measures would continue.

4.6.4 UNAVOIDABLE ADVERSE IMPACTS

There would be no unavoidable adverse impacts under any of the alternatives. The BMPs state that no well pads should developed in the designated 100-year floodplain of Bitter Creek; thus, the Bitter Creek 100-year floodplain and its associated wetlands would not be affected by the Proposed Action.

4.7 WILDLIFE

To determine the impacts of the different alternatives to the wildlife resources and their associated habitats, the specific project components were examined relative to the temporal and spatial patterns of both resident and migratory wildlife species and the current wildlife population trends apparent in the RDG Project Area. The primary impacts to terrestrial wildlife resources include:

1) loss of or disturbance to broad areas of native habitat;
2) fragmentation of connected habitats;
3) displacement of wildlife from traditional use areas;
4) direct loss of wildlife;
5) diminished use of traditional habitats due to effects of noise, dust emissions, and human presence; and
6) interruption or interference with life cycle functions, including courtship, nesting, and birthing, as well as migration and winter survival.

These six potential impacts are addressed in general terms for all wildlife except mule deer, which is analyzed in greater detail for potential impacts.

The severity of both short- and long-term impacts upon a given species would depend on factors such as the sensitivity of the species, its seasonal use patterns, the type and timing of project activities, and physical parameters as topography, forage availability, and climate.

4.7.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1 – PROPOSED ACTION

4.7.1.1 AQUATIC SPECIES

A discussion of potential impacts to aquatic species from the Proposed Action is included in Section 4.8, Special Status Species.

4.7.1.2 TERRESTRIAL WILDLIFE

One of the most prominent impacts to wildlife as a result of implementation of the Proposed Action would be the short-term effect of wildlife displacement, particularly during the construction phase. In response to the increase in human activity, equipment operation, vehicular traffic, and noise, wildlife would avoid or move away from the sources of disturbance to other habitats. This avoidance, or displacement, would also result in under-use of the physically unaltered habitats adjoining the disturbances. The net result would be that the value of the habitats near the disturbances would be decreased, previous distributional patterns would be altered, and the habitats would not support the same level of use by wildlife as before the onset of the disturbance. Additionally, use of other habitats would increase as the animals move away from the disturbances; at least some degree of overuse and degradation would occur in these increasingly occupied habitats. The degree of avoidance by wildlife would vary by species and individual. The primary concern for displacement effects would be for mule deer and elk, which are discussed in detail below.

Displacement of big game (mule deer and elk) due to human activity has been documented by various studies, including Rost and Bailey (1979) and Ward et al. (1980). These studies suggest human disturbances, including traffic on roads, reduces the use of nearby habitats by deer and elk. The actual distance animals moved in order to escape the disturbance varied, ranging from approximately 660 feet (200 m) for deer to more 2,600 feet (800 m) for elk. The distances were observed to be influenced by topography, the presence of vegetation that screened the disturbance, the intensity of the activities or disturbance, the speed of traffic, and the amount of out-of-vehicle activity.

Depending upon the carrying capacity of the habitats and the number of animals involved, displacement would likely result in the reduced use of habitats near the disturbances and overcrowding of habitats into which the animals are displaced. This overcrowding may cause an increase in competition for space and forage, an increase in the animals' stress, and a decrease in the animals' physical conditions. Winter mortality may also increase and successful reproduction may decrease. The effects of displacement would be of greatest concern in the crucial and high-value big game winter ranges.

Efforts to revitalize wildlife habitat in and adjacent to the Project Area would take place following completion of production operations. Well pads and other facilities would be removed, and the areas would be revegetated with seed mixes approved by the BLM, some of which are specifically oriented to enhance wildlife use. The duration of impacts to vegetation would depend, in part, on the success of mitigation and reclamation efforts and the time needed for natural succession to return revegetated areas to pre-disturbance conditions. Grasses and forbs are expected to become established within the first several years following reclamation; however, an estimated 8 to 20 years would be required for shrub establishment and production of useable forage (Plummer et al. 1968 and Wasser and Shoemaker 1982). Consequently, the disturbance of pinyon-juniper and sagebrush habitats within the Project Area would represent a long-term loss to those species that depend on such vegetation for forage and shelter.

It is possible that certain wildlife would adapt to the increase in human activity. For example, although deer and elk tend to avoid human activities and vehicular traffic, they do adapt to these disturbances to some degree. This is particularly apparent when the disturbances are predictable or constant in occurrence and when no out-of-vehicle activity occurs. Additionally, non-migratory and non-hunted populations tend to adapt more readily.

4.7.1.2.1 Mule Deer

Assessing the short- and long-term effects to mule deer resulting from the Proposed Action is complex and difficult to quantify. This analysis focuses on impacts to mule deer and crucial and critical winter habitat within the RDG Project Area. Due to differences between BLM crucial mule deer winter range habitat, as designated in the Book Cliffs RMP EIS (BLM 1984), and the current critical winter range habitat identified by UDWR (see Section 3.7.3.1), quantification of impacts to the habitat is presented for both.

The primary, direct impact to wintering mule deer would be immediate loss of forage and wintering habitat. Within the RMP designated crucial mule deer winter range, 45 wellsites (81.0 acres) and 13.4 miles of access road (48.7 acres) would be constructed on BLM-administered lands. This would remove 129.4 acres of mule deer forage. Another 10 wellsites (18.0 acres) and 3 miles of access roads (10.8 acres) could be constructed on Utah SITLA-administered lands, removing an additional 28.8 acres of forage. In total, within the RDG Project Area, 158.5 acres (1.20%) of the crucial mule deer winter range, as designated in the 1985 Book Cliffs RMP, would be directly impacted and forage production for wintering mule deer would be lost for the life of the project. This habitat loss represents 0.07% of the overall crucial mule deer winter range habitat designated in the RMP.

On UDWR identified critical deer winter range, which includes the BLM designated crucial habitat, an additional 81 wellsites and 24.1 miles of access road are proposed on BLM administered lands, and another 8 wells with 2.4 miles of access roads are proposed on non-BLM lands. Overall, 144 wells and 42.9 miles of roads would be constructed resulting in direct impact to approximately 414.0 acres of crucial winter range habitat, and forage production for wintering mule deer would be lost for the duration of the project. This direct loss represents 1.20% of the UDWR identified critical mule deer winter range habitat in the RDG Project Area and 0.15% of the UDWR winter habitat in the region.

A loss in habitat value would result from fragmentation of continuous habitats, and increased human access into the region. These direct and indirect impacts include: (1) the disturbance of large, unbroken blocks of native habitat; (2) animal displacement; (3) increased human presence from project operations and increased road access; (4) increased vehicle-related deer mortalities resulting from an increase in roads and vehicular traffic; (5) improved hunter access; and (6) increased disturbance or harassment of deer from noise, illegal shooting, poaching, and OHV use.

Habitat fragmentation and associated displacement of animals would result in a reduction in habitat use near disturbed areas (a loss of habitat value), increased animal densities on adjoining habitat (which may be of poorer quality), increased stress from both intra- and inter-specific competition and increased human-induced harassment, particularly along existing and proposed new access roads. The degree of mule deer displacement and reduction in habitat value would vary, depending on the habitat types, vegetative cover, topography, existing herd size, winter snow conditions, animal health, traffic levels, and future road use.

Roads have been shown to disrupt populations of large mammals, even if the road does not present a physical barrier, as would be the case in more open, shrubland and grassland habitats (Andrews 1990, Richardson 1992, Woodward-Clyde 1995). Karpowitz (1984) reported that roads resulting from energy development within the Book Cliffs area may have caused a greater level of impact to mule deer than direct habitat loss from these projects. The development of new access roads, in combination with existing roads, would facilitate access for other development projects, recreational uses, hunting, and OHV use. Studies have reported that roads generally reduce the overall habitat value for mule deer for distances of 300 feet to 0.5 mile from the road (Rost and Bailey 1979, CDOW 1987), depending on types of traffic and adjacent habitat types. For comparison purposes, it is interesting to note that as a result of these and other studies, the Colorado Division of Wildlife (CDOW) has recommended that the combined length of any roads left open to public access should be less than 1.0 mile of road per square mile of habitat (CDOW 1987). On average (assuming an average of 0.3 mile of new road per well for 423 wells), the proposed road density within the RDG Project Area would be approximately 1.0 mile per square mile. If the project were fully implemented, the density of the proposed and existing road network within the 1985 RMP winter range would be 2.02 miles per square mile, while the density within UDWR's critical deer winter range would be 1.70 miles per square mile. In some areas (areas of high natural gas productivity and development, and thus, a greater concentration of wells), these road densities may be higher, while other areas with low natural gas potential would have road densities lower than the average.

To estimate indirect habitat loss for this EIS, it was assumed that the habitat value of crucial mule deer winter range would be reduced within 660 feet (0.125 mile) of an access road. This figure is based on overall deer use in the region, adjacent habitat types, existing traffic levels, and BLM observations of mule deer avoidance of roads and of road disturbance. Mule deer avoidance would be greater in the more open habitats, such as sagebrush, and less in denser cover, such as pinyon-juniper woodlands. Topography near the roads would also influence avoidance levels. For evaluation purposes, BLM assigned a 50% reduction in habitat value within the 660 feet area adjacent to the new access roads. It is assumed that some deer use would

occur within this zone of influence but use would be affected by increasing traffic, noise, human presence, hunter use, and poaching.

Approximately 1,312 acres of BLM-designated crucial winter range habitat would be indirectly impacted through the construction of roads and the resulting increase in vehicular and human access during the winter months. With the addition of the 158.5 acres of the direct habitat lost within the Book Cliffs RMP designated crucial mule deer winter range, a total of 1,470 acres of RMP designated crucial winter habitat would be either directly or indirectly affected by implementation of the Proposed Action. This represents 11.5% of the RMP-designated crucial deer winter range within the RDG Project Area and 0.7% of the BLM-designated habitat in the region.

On UDWR-identified critical mule deer winter range, which includes the RMP designated crucial winter habitat in the RDG Project Area, 3,342 acres would be indirectly affected. A combined total of approximately 3,756 acres of mule deer critical winter range would be impacted directly or indirectly by implementation of the Proposed Action. This represents 11.1% of the UDWR identified critical deer winter range within the RDG Project Area and 1.4% of the UDWR identified critical deer winter range within the region.

Within the RDG Project Area, lease stipulations for big game protection were not identified in the 1985 Book Cliffs RMP. Any drilling and construction activities during winter months would impact deer utilizing winter range habitat.

Human disturbance and presence also reduce the relative habitat value for deer (Nicholson et al. 1997), especially during periods of heavy snow cover and cold temperatures. Mule deer typically experience severe physiological stress during winter, particularly gestating does (UDWR 1997a, Karpowitz 1984), which require higher levels of energy for survival and successful reproduction. The increased presence of vehicles and humans utilizing the road network could result in increased energy expenditures during severe winter periods, as well as insufficient forage intake (Karpowitz 1984, Garrott and White 1982, Woodward-Clyde 1995). Hobbs (1989) determined that human-induced disturbance to mule deer (two disturbances per day, each disturbance causing the animals to move a minimum of 1,500 feet) during a severe winter period could double doe mortality. Disturbances during the winter could prevent access to sufficient amounts of forage to sustain individual deer. Mule deer in South Dakota require an average of 3.5 to 4.0 pounds of dry-weight forage per 100 pounds of body weight during the winter season (Richardson and Petersen 1974). A deer's ability to survive the winter and a doe's ability to produce viable offspring ultimately depend on fat reserves, which are continuously used during the winter. Increased stress that causes these fat reserves to be used more quickly, reduces survival for deer and reduces the intrauterine survival of fawns. Parker et al. (1984) demonstrated that energy expenditures associated with deer moving through snow increased exponentially as snow depth increased relative to the height of a deer or sinking depth of an animal in snow. Therefore, fawns expend more energy than adults moving through snow with similar depth and consistency. Increased human activity or harassment, combined with a severe winter event as occurred in the Book Cliffs in 1983-84 and again in 1992-93, could lower deer survival, particularly fawns, and may lower doe fecundity. Human-related factors or events on winter

ranges that cause mule deer to expend energy during winter, in addition to natural environmental factors, will increase over-winter mortality (BLM 1999a, 1999c).

The behavioral responses of mule deer to well and road development would include increased energy expenditures for avoidance of human activity and alterations of normal habitat use patterns. Karpowitz (1984) reported that oil and gas activities within the Book Cliffs area during the winter period have previously resulted in avoidance behavior of active drilling sites. Although earlier baseline data are not available, a report (Hanberg et al. [2000]) that summarizes the data gathered during several winter flights within the RDG Project Area, suggests that mule deer may be avoiding the vicinity of active gas well development and maintenance. Wintering mule deer do vacate areas surrounding well pads during periods of concentrated human activity (Reeve and Krawczak 1995), but their response to production and well maintenance operations along collector roads is more ambiguous. The level of harassment, human presence, noise, and whether humans remain in their vehicles may determine the degree of avoidance surrounding an energy development. Over time, some deer will habituate to certain disturbances, depending on distance to available food, water, and cover. Deer habituation to disturbances, however, is more likely to occur in unhunted or nonmigratory populations (Behrend and Lubeck 1968). Nicholson et al. (1997) reported that migratory mule deer appear to be more sensitive to human disturbances, remaining farther away from the disturbances than non-migratory deer. Upon final reclamation, both mule deer and elk have been shown to return to disturbed areas (Karpowitz 1984).

Deer displacement could result in increased pressures on remaining areas within the crucial winter range, especially as the deer herd approaches UDWR's herd management goal of 10,000 animals for the North Book Cliffs Herd Unit. Animal displacement would result in an overall reduction of available range for the entire unit. Based on the anticipated reduction in habitat values for mule deer on the winter range, the population could exhibit an overall slower recovery rate. Full development of the proposed well field and associated road network could reduce the carrying capacity of the range, which could limit the capability of the herd to meet UDWR's mule deer population goal of 10,000 deer for the herd unit (the mule deer population for the North Book Cliffs Herd Unit is currently below the relative carrying capacity of the range, and is approximately 63.5% of UDWR's management goal).

To estimate the effects on mule deer numbers from the Proposed Action, one could assume an even distribution of 10,000 deer over the entire crucial mule deer winter range of 273,974 acres, arriving at a density estimate of one deer per approximately 27 acres. This assumption oversimplifies a very complex system, since deer are not evenly distributed across all habitat types within crucial winter range. However, lacking more specific data, assuming an even distribution of deer across the winter range would at least provide some indication of the minimum number of deer that could be affected by the different alternatives. Therefore, assuming an even distribution of deer within crucial winter range, the direct and indirect impacts to 1,470 acres of 1985 RMP designated crucial winter range from well pad and road development would remove habitat for an estimated 53 deer (i.e., the range would cease to support 53 deer). Applying the assumption to UDWR's identified critical deer winter range within the RDG Project Area would result in the loss of habitat for 139 deer. The loss of these deer from the herd unit would persist in the long term until development activities cease and

successful reclamation is completed. Therefore, UDWR's population goal of 10,000 mule deer could take longer, and recovery efforts would be affected.

4.7.1.2.2 Elk

The impacts to resident and migratory elk would be limited to increased disturbance to individuals from well and road development, overall habitat fragmentation, and indirect effects similar to those discussed for mule deer. It has been shown that increasing road densities to 1 mile per square mile of available habitat can reduce the habitat effectiveness and value for elk up to 40%, compared to roadless areas. As road density increases to 6 miles per square mile, elk use of available habitat decreases to zero (Noss and Cooperrider 1994). Development of wells or roads in low-elevation drainages with surface water resources, including Asphalt Wash, would result in animal avoidance and decreased water availability for summering elk, and could adversely impact resident elk. However, the numbers of impacted elk would likely be low due to the low number of elk in the RDG Project Area (UDWR 1998).

4.7.1.2.3 Pronghorn

The primary impact for resident pronghorn would be the surface disturbance from well and road development in the vicinity of the Asphalt Wash guzzler and permanent water sources within Asphalt Wash. Project activities in proximity to the guzzler and flowing wells that may limit use by pronghorn would result in adverse impacts to the pronghorn population currently utilizing the RDG Project Area. Indirect impacts would include habitat loss from fragmentation and increased human access of the area.

4.7.1.2.4 Raptors

Potential impacts to the bald eagle, northern goshawk, short-eared owl, burrowing owl and ferruginous hawk are discussed in Section 4.8.2, Special Status Wildlife Species. Generally, implementation of the Proposed Action could impact both breeding and wintering raptors, depending on the location of the proposed well and access roads relative to occupied territories, active or inactive nest sites, or wintering areas (e.g., available cover, food, or prey availability). Development or road construction in proximity of an active nest could result in abandonment and could affect the breeding pair and their annual productivity. Nearby roads and wellsites could prevent a nest from being used in the future, since many species of raptors alternate between nest sites within a breeding territory. Based on current raptor data, more than 19 nest sites, composing 17 different territories, could be affected by the Proposed Action depending on well and road construction.

Implementation of the Proposed Action would fragment raptor habitat and remove some specific habitats that have the potential to provide nesting opportunities for raptor species. This would preclude raptors' use of some wintering areas, particularly within pinyon-juniper woodlands, that provide high-quality cover and prey species. These impacts would continue through project operation as a result of increased vehicle use and human presence along the project roadways.

Loss of habitat for the prey base of raptors would directly impact birds foraging in the RDG Project Area. Grant et al. (1991) suggest that incremental destruction of habitat for raptors' prey

base (e.g., ground squirrels, rabbits and mice) has had the largest effect on raptor populations in the Uinta Basin. A slight reduction in cottontail and small mammal populations would be anticipated from the Proposed Action (see Sections 4.7.2.2.5 and 4.7.2.2.7).

4.7.1.2.5 Upland Game

Impacts to greater sage grouse are discussed in Section 4.8.2, Special Status Species. Generally, impacts to upland game birds would include loss of breeding habitat and increased hunting pressure. Mourning dove would be slightly impacted by habitat loss and by direct loss if construction activities occur during the nesting season. The loss of nesting and brooding habitat for this species would be minimal, because of the large amount of habitat available to the species within the RDG Project Area.

Impacts to chukar would be minimal, because of the rarity of the species in the RDG Project Area, and because project activities would avoid the 100-year floodplain in Bitter Creek, the most likely area for the species to occur.

A slight decrease in the populations of the two cottontail species occurring in the RDG Project Area would be anticipated during construction activities, either as mortality or as a result of habitat loss. These species normally habituate to human activities and are frequently found around gas well facilities. Road kill losses and hunting pressure would also be expected to increase as the number of roads and traffic increases. Because of the cyclic nature of these species, any population decrease would be essentially indiscernible.

4.7.1.2.6 Furbearers/Predators

The Proposed Action would have little or no effect on furbearers or predators found within the RDG Project Area. Aquatic furbearers such as beaver and muskrat would be unaffected, because RDG project activities would avoid the 100-year floodplain of Bitter Creek. Predators such as coyote, gray fox, bobcat, and red fox would be minimally impacted by direct habitat loss, resulting prey loss, and the development of new roads that would allow greater numbers of hunters and trappers to access habitat that was previously inaccessible.

No impacts to black bears would be anticipated, as they are primarily migrants through the RDG Project Area.

Effects to mountain lions would include a reduction in prey availability and a possible increase in harassment to, or removal of, individual lions from the increasingly developed area.

It is assumed that the local mountain lion population is closely associated with the migratory mule deer herd. It also is assumed that the lion population is currently stable. Because of this association, changes to the deer herd would result in corresponding changes to the mountain lion population. Deer displacement may actually improve lion success on mule deer predation in the short term, based on the increased stress levels of the deer as they move into more unfamiliar territories. Roads associated with well development would permit access for hunters and recreationists into areas that may currently be inaccessible. Consequently, some increased legal and illegal hunting and possible harassment of individual animals may result.

4.7.1.2.7 Small Mammals

Implementation of the Proposed Action is likely to displace or remove at least some individuals of species in this group through the removal of existing habitats during direct disturbance of 1,222 acres (approximately 1.5% of the RDG Project Area). However, the effects of these displacements and removals are not expected to be substantial or long-term. Species in these groups are either highly mobile or have very high reproductive rates. The highly mobile species would experience displacement and would adjust to the loss of 1,222 acres by moving away from the disturbance. The less mobile species, which usually have higher reproductive rates, would experience the loss of individuals, but would compensate for the loss through their reproductive rates.

Loss of shrubs and fragmentation of shrub-dominated habitat would have both short- and long-term impacts to some small mammal species. Removal of shrubs for roads and well pads could make some small mammals, such as black-tailed jackrabbit and golden-mantled ground squirrel, more susceptible to predation from raptors. Overall, small mammal species would experience minimal reduction in numbers due to the loss of habitats.

4.7.1.2.8 Waterfowl, Shorebirds, Songbirds and Neotropical Migratory Birds

Approximately 1,222 acres (1.5% of the RDG Project Area) of surface disturbance from the Proposed Action would result in a loss of some habitat or nest sites of resident and neotropical migratory bird species. Access roads and increased traffic could result in more vehicle collisions with birds. Habitat loss would occur near drainages such as Evacuation Creek and Asphalt Wash, but impacts would be minimal because of the large amount of habitat available to the species within the RDG Project Area and avoidance of activities within the Bitter Creek floodplain.

The impacts of the Proposed Action on neotropical migratory birds that do not breed within the area would not be large. Non-breeding birds generally use riparian areas for feeding, and these areas would not be affected by construction activities. The short-term effects of access road and wellpad construction on breeding populations would be to destroy an unknown, but probably small number of active nests, eggs, and young birds. The long-term effects would cause a reduction in the amount of habitat present, but the long-term effects on migratory bird populations are unknown.

4.7.1.2.9 Reptiles and Amphibians

Impacts to reptiles would be minimal and result from the direct loss of animals and habitat during development. Access roads and increased traffic would likely result in increased road kills of snakes.

4.7.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

4.7.2.1 AQUATIC SPECIES

A discussion of potential impacts to aquatic species from Alternative 2 will follow in Section 4.8, Special Status Species.

4.7.2.2 TERRESTRIAL WILDLIFE

See Section 4.7.1.2.

4.7.2.2.1 Mule Deer

Direct and indirect impacts to mule deer habitat from surface disturbances would be similar to those described for the Proposed Action in Section 4.7.1.2.1. The primary differences would be a result of environmental considerations identified for this alternative (see Section 2.2.1).

Direct impacts from surface disturbance of roads and wellsites would be offset in the long term by enhancement of 1.5 acres of land for every acre of browse habitat on public lands disturbed within the RMP designated crucial winter range.[2] The enhancement should be conducted on public lands within RMP-designated crucial mule deer winter range within the RDG Project Area and could consist of activities such as:

- pinyon-juniper cuttings or pushovers;
- pinyon-juniper prescribed burns and re-seedings;
- decadent sagebrush bottom burns and re-seedings;
- greasewood control;
- invasive plant control;
- re-seeding of wildfire areas;
- browse plantings;
- guzzler maintenance;
- water developments;
- closure and re-seeding of unnecessary roads; and
- winter closure of some access roads.

Appropriate mule deer habitat enhancement would be identified, developed, and analyzed in association with individual drilling applications.

[2] The 1.5:1 acre enhancement value was determined through professional judgment of BLM biologists, based on the indirect impacts of lost wildlife habitat value. It is unlikely that wildlife will use the habitat surrounding the roads and wellsites as they did prior to the construction disturbances. Thus, mitigation was extended beyond the direct, construction-related disturbances.

For analysis purposes and based on professional judgment, it was assumed that 1/3 of the development within RMP-designated crucial mule deer winter range would take place in browse habitat. Under this assumption, approximately 43 acres of browse habitat on public lands would be disturbed, resulting in the need for 65 acres of on-site habitat enhancement. Applying this offset to anticipated total direct and indirect acreage, there would be a net loss of 1,405 acres of BLM-designated crucial winter range habitat. This value represents 11% of the RMP-designated crucial winter range in the RDG Project Area and 0.06% of the designated crucial winter range habitat in the region.

Within the RMP-designated crucial mule deer winter range, direct disturbance of wintering mule deer from drilling activities during a critical time of the year would be avoided under this alternative. New surface-disturbing activities, such as well pad or access road construction, would not be allowed within the BLM-designated crucial deer winter range from November 15 to April 15. Wells that were under construction on November 1 could be completed, as long as all construction activities were accomplished by December 1. By avoiding winter drilling and construction activities, mule deer would generally not be forced from traditional wintering areas onto possibly less productive habitat or onto habitat that is already occupied by other wintering animals. Stress-related impacts would be reduced.

Under Alternative 2 – Additional Wildlife Considerations, seasonal restrictions and on-site mitigation would not be applied to wells and associated roads within 20,936 acres of the 33,694 acres of UDWR-identified critical mule deer winter range within the RDG Project Area. This area is outside of the RMP designated crucial winter range where the environmental considerations would be applied under this alternative. Both direct and indirect effects to wintering mule deer within this 20,936-acre area would be similar to those described in the Proposed Action. The total direct and indirect impacts to the UDWR-identified critical winter range habitat would be approximately 3,691 acres. This represents 11% of the UDWR-identified critical habitat in the RDG Project Area and 1.3% of the UDWR-identified habitat in the region. Note that the identified critical deer winter range does not include adjacent tribal lands; these estimates could be less than noted.

Using the same mule deer population assumptions developed for the Proposed Action (one deer per 27 acres), development under Alternative 2 would remove habitat for approximately 50 deer from BLM-designated crucial winter range lands. On UDWR-identified critical winter range, habitat for 132 deer would be lost.

4.7.2.2.2 Elk

Impacts to elk would be similar to those described in Section 4.7.1.2.2; however, protection measures for big game species would reduce effects. Limitations of winter drilling would provide undisturbed wintering areas for elk. Mitigation required for development within crucial mule deer winter range, such as pushovers, burns, re-seedings, and road rehabilitation or closures, would also improve habitat for elk using the area. Restricting new access road development or well placement within 3 miles of the Asphalt Wash guzzler and the flowing wells in Asphalt Wash would provide undisturbed water sources for elk throughout the dry summer period.

4.7.2.2.3 Pronghorn

Direct impacts to pronghorn would be minimal, as surface disturbance in the vicinity of Asphalt Wash would be limited. Environmental considerations would prohibit new construction within 3 miles of the water development, within 3 miles of flowing wells in Asphalt Wash, and within 3 miles of the Center Fork of Asphalt Wash. Indirect impacts would, however, include habitat loss from fragmentation and increased human access into the general area.

4.7.2.2.4 Raptors

Impacts to raptors would be similar to those identified for the Proposed Action. The environmental considerations of Alternative 2 – Additional Wildlife Considerations, including seasonal limitations within specified distances and prevention of construction within BLM recommended buffer areas (BLM 1994) would reduce impacts such as nest abandonment and productivity. Disturbance to foraging raptors would occur, as some prey species may be diminished through loss or fragmentation of habitats. However, habitat enhancement required for development on crucial mule deer winter range could improve raptor foraging habitat by reducing pinyon-juniper tree cover and thick, decadent stands of big sagebrush, thereby making prey species more available. Environmental considerations for other species and resources, such as winter closure periods, would reduce impacts to raptors utilizing the areas.

4.7.2.2.5 Upland Game

Same as Section 4.7.1.2.5.

4.7.2.2.6 Furbearers/Predators

Same as Section 4.7.1.2.6.

4.7.2.2.7 Small Mammals

Impacts to small mammals under this alternative would be similar to those described in Section 4.7.1.2.7. Habitat enhancement for mule deer would disturb some habitat and increase the initial amount of direct disturbance to small mammals. Small mammals would be susceptible to increased predation from raptors with any reduction in pinyon-juniper tree cover. In the long term, small mammal populations would recover to populate the disturbed areas.

4.7.2.2.8 Waterfowl, Shorebirds, Songbirds, and Neotropical Migratory Birds

Effects to waterfowl and shorebirds would be the same as those described in Section 4.7.1.2.8. Impacts to resident songbirds and migratory birds under this alternative would be similar to those described in Section 4.7.1.2.8. Habitat enhancement for mule deer would cause increased short-term displacement impacts to those bird species that inhabit pinyon-juniper areas.

4.7.2.2.9 Reptiles and Amphibians

Same as Section 4.7.1.2.9.

4.7.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

4.7.3.1 AQUATIC SPECIES

A discussion of potential impacts to aquatic species from Alternative 3 will follow in Section 4.8, Special Status Species.

4.7.3.2 TERRESTRIAL WILDLIFE

See Section 4.7.1.2.

4.7.3.2.1 Mule Deer

Direct and indirect impacts to mule deer habitat from surface disturbances associated with Alternative 3 would be similar to those described for the Proposed Action in Section 4.7.1.2.1. Alternative 3 differs from the Proposed Action as protection measures addressing mule deer would be expanded to apply not only to BLM-crucial mule deer winter range, but also to the UDWR-identified critical winter range.

The direct and indirect impacts to wintering mule deer from production and maintenance operations would be the same as described in Section 4.7.1.2.1. As with Alternative 2, direct impacts from surface disturbance of roads and wellsites would be offset in the long term by enhancement of 1.5 acres of land for every acre of browse habitat disturbed on BLM-administered lands within the UDWR identified critical winter range. The enhancement would be conducted on public lands in the UDWR-identified critical mule deer winter range within the RDG Project Area. It would consist of activities such as:

- pinyon-juniper cuttings or pushovers;
- pinyon-juniper prescribed burns and re-seedings;
- decadent sagebrush bottom burns and re-seedings;
- greasewood control;
- invasive plant control;
- re-seeding of wildfire areas;
- browse plantings;
- guzzler maintenance;
- water developments;
- closure and re-seeding of unnecessary roads; and
- winter closure of some access roads.

Mule deer habitat enhancement would be identified, developed, and analyzed in association with individual drilling applications.

For analysis purposes, and based on professional judgment, it was assumed that 1/3 of the development within UDWR-identified critical mule deer winter range would take place in browse habitat. Under this assumption, approximately 121 acres of browse habitat on public lands would be disturbed, resulting in the need for 181 acres of habitat enhancement. Applying this offset to anticipated total direct and indirect acreage, there would be a net loss of 3,575 acres within UDWR identified critical winter range habitat. This value represents 10.6% of the UDWR identified critical winter range in the RDG Project Area and 1.3% of the UDWR's critical winter range habitat in the region. It should be noted that the identified critical deer winter range does not include adjacent tribal lands; these estimates could be less than noted. Direct and indirect habitat acreage loss estimates in the RMP-designated crucial winter range would be the same as presented in Alternative 2.

Within the UDWR identified critical mule deer winter range, direct disturbance of wintering mule deer from drilling activities on public lands during a critical time of the year would be avoided under this alternative. New surface disturbing activities, such as well pad or access road construction, would not be allowed from November 15 to April 15. By avoiding winter drilling and construction activities, mule deer would generally not be forced from traditional wintering areas onto possibly less productive habitat, or habitat that is already occupied by other wintering animals. Stress-related impacts would be reduced.

Using the same mule deer population assumptions developed for the Proposed Action (one deer per 27 acres), development under Alternative 3 would remove habitat for approximately 50 deer from BLM-designated crucial winter rangelands. On UDWR-identified critical winter range, habitat for 129 deer would be lost.

4.7.3.2.2 Elk

Outside the UDWR-identified critical deer winter range area, impacts to elk would be similar to those described in Section 4.7.1.2.2. Protection measures for big game species would reduce effects to elk within the UDWR-identified big game winter range. Limitations of winter drilling would provide undisturbed wintering areas for elk. Habitat mitigation required for development within crucial mule deer winter range, such as pushovers, burns, re-seedings, and road rehabilitation or closures, would also improve habitat for elk using the area. Restricting new access road development or well placement within 3 miles of the Asphalt Wash guzzler and the flowing wells in Asphalt Wash would provide undisturbed water sources for elk throughout the dry summer period.

4.7.3.2.3 Pronghorn

Same as Section 4.7.2.2.3.

4.7.3.2.4 Raptors

Impacts to raptors under this alternative would be the same as Section 4.7.2.2.4, except that the USFWS raptor protection guidelines would be followed, with additional environmental considerations that would protect winter-roosting raptors and provide long-term protection for unoccupied nests. The elimination of 50 wells and associated roads within the White River

inventory area and the UWC proposed wilderness units the BLM has determined likely to have wilderness characteristics would further reduce the impacts to raptors in the RDG Project Area by preserving existing raptor habitat.

4.7.3.2.5 Upland Game

Same as Section 4.7.1.2.5.

4.7.3.2.6 Furbearers/Predators

Impacts to furbearers/predators under this alternative would be the same as Section 4.7.1.2.6, except that the elimination of 50 wells within the White River inventory area and the UWC proposed wilderness units the BLM has determined likely to have wilderness characteristics would reduce the impacts to furbearer/predator habitat in the RDG Project Area by preventing access roads from being built into these areas.

4.7.3.2.7 Small Mammals

Same as Section 4.7.2.2.7, except that the elimination of 50 wells within the White River inventory area and the UWC proposed wilderness units the BLM has determined likely to have wilderness characteristics would reduce the impacts to small mammal habitat in the RDG Project Area.

4.7.3.2.8 Waterfowl, Shorebirds, Songbirds, and Neotropical Migratory Birds

Same as Section 4.7.1.2.8.

4.7.3.2.9 Reptiles and Amphibians

Same as Section 4.7.1.2.9.

4.7.4 Direct and Indirect Effects of Alternative 4 – No Action

Under the No Action Alternative, oil and gas exploration and development would continue at a rate of approximately 2 - 5 wells per year, which has been the average rate of development in the past few years. Fifty-five wells would be drilled during the period considered for this analysis. Most activities would be anticipated near existing production. Approximately 160 acres of surface would be disturbed by wellsite and road construction, which would represent approximately 0.2% of the overall RDG Project Area. BMPs as described in Section 2.1.12 would not be included as part of an individual application.

Direct and indirect impacts to wildlife from surface disturbances would be similar to those described for the Proposed Action in Section 4.7.2, but proportionately less. Standard lease stipulations would apply to any wells drilled, as there are no wildlife-related special stipulations on current leases issued under the provisions of the Book Cliffs RMP.

Disturbances to big game, particularly mule deer, would be similar to those described for the Proposed Action but at a much slower rate and over a longer time period. Approximately 9 wells

have been assumed for proposal within the RMP-designated critical deer winter range. Surface disturbances would total approximately 26 acres (for wells and roads disturbances). In the UDWR identified critical winter range, 23 wells would be anticipated, disturbing approximately 66 acres from new wells and roads (the disturbance estimate for the UDWR critical winter range includes the RMP winter range estimates).

Wells could be placed near occupied or inactive raptor nests, which could disrupt nesting activity or preclude nests from being used in the future. Site-specific mitigation could include seasonal limitations of work within specified distances of active nests and prevention of construction within 0.25 mile of nest sites, which would reduce impacts such as nest abandonment and productivity. Direct impacts to small mammals, upland birds, waterfowl, shorebirds and songbirds, and reptiles and amphibians would be similar to those described for the Proposed Action, but without BMPs, wells could be placed in the Bitter Creek floodplain, increasing potential impacts to wildlife using this area.

4.7.5 IMPACTS SUMMARY

All four of the alternatives would involve similar types of effects on wildlife. However, the magnitude of the effects would vary according to the number and distribution of facilities. The Proposed Action would have the most impact upon the mule deer and their wintering grounds. Alternative 2 – Additional Wildlife Considerations would have fewer direct impacts on mule deer from surface disturbance of roads and wellsites. This would be due to the disturbances being offset in the long term by enhancement of 1.5 acres of land for every acre of browse habitat on public lands disturbed within the RMP designated crucial winter range. Alternative 3 differs from the Proposed Action, in that environmental considerations addressing mule deer would be expanded to apply not only to BLM crucial mule deer winter range, but also to the UDWR-identified critical winter range. Alternative 4 direct and indirect impacts to mule deer from surface disturbances would be similar to those described for the Proposed Action, but proportionately less.

The Proposed Action could have a negative impact on both breeding and wintering raptors. Development or road construction in proximity of an active nest could result in abandonment and could affect the breeding pair and their annual productivity. Nearby roads and wellsites could prevent a nest from being used in the future. In addition, the Proposed Action would fragment raptor habitat and remove some specific habitats that may provide future nesting opportunities for raptor species. Alternative 2 and Alternative 3 impacts to raptors would be similar to those identified for the Proposed Action, but the environmental considerations including seasonal limitations within specified distances and prevention of construction within BLM recommended buffer areas of nest sites for Alternative 2 (see Section 2.2.1.4.3) and the USFWS guidelines and recommended protection measures in Alternative 3 (see Section 2.3.1.3) would reduce impacts such as nest abandonment and productivity. Alternative 4 impacts to raptors from surface disturbances would be similar to those described for the Proposed Action but on a smaller scale. However, wells could be placed near occupied or inactive raptor nests, which could disrupt nesting activity or preclude nests from being used in the future.

Other species of terrestrial wildlife present in the Project Area would experience varying degrees of effects from the implementation of the alternatives. These effects could include the loss of habitats, displacement from presently occupied habitats, and the loss of some individuals. In general, impacts to these other species of terrestrial wildlife would be minimal.

4.7.6 MITIGATION

4.7.6.1 ALTERNATIVE 1 – PROPOSED ACTION

- Do not allow drilling of wells or construction of access roads on BLM-administered lands from January 1 to March 1, within the RMP-designated crucial mule deer winter range. As described in 43 CFR 3101.1-2, this 60-day lease restriction period may be imposed to prohibit new surface-disturbing operations in order to protect wildlife. Based on the professional judgment of BLM biologists, the January 1 to March 1 time period was chosen as the most effective time of the year to minimize disturbances to mule deer.
- Site 45 wells and 13.4 miles of access roads within pinyon-juniper dominated habitat, where feasible, to reduce disturbance to mule deer foraging habitat. Proposed wellsites and roads may be relocated up to 200 feet, as described in 43 CFR 3101.1-2, to protect wildlife.
- Require 1 acre of mitigation for every acre of disturbance within browse habitat on 12,785 acres of RMP-identified crucial mule deer winter range. The rationale for the 1:1 acre disturbance mitigation for this alternative (as compared to the 1:1.5 acre disturbance mitigation in Alternatives 2 and 3) was based on the mitigation limits imposed by the current RMP.
- Close and rehabilitate unnecessary roads and trails as determined by the BLM.
- Avoid developing loop roads within RMP-identified crucial mule deer winter range.
- Prohibit drilling within .5 mile of active golden eagle nests from February 1 to July 15, and active nests of all other raptors from February 1 to July 15, and all other raptor nests from April 1 to July 15. These restrictions would also apply to workover rigs.
- Site all locations as far from inactive raptor nests as possible, up to .5 mile. Attempt to topographically conceal the work locations and access roads from the nest. The timing restriction is important because not all raptor pairs breed every year or utilize the same individual nest within a nesting territory. Many individual raptor nests left unused for a number of years are eventually reoccupied.
- Site all roads and well pads as far from permanent water sources as possible, up to 1 mile.

It should be noted that some forms of mitigation might not be effective during the current drought period. Big game populations are declining from causes related to the lack of water and the lack of forage on which they depend. This is an uncontrolled effect, beyond the scope of wildlife population management.

4.7.6.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

- Do not allow drilling of wells or construction of access roads on BLM-administered lands from January 1 to March 1, within the UDWR-designated critical mule deer winter range. As described in 43 CFR 3101.1-2, this 60-day lease restriction period may be imposed to prohibit new surface-disturbing operations in order to protect wildlife. Based on the professional judgment of BLM biologists, the January 1 to March 1 time period was chosen as the most effective time of the year to minimize disturbances to mule deer.
- Site 126 wells and 37.5 miles of access roads within pinyon-juniper dominated habitat, where feasible, to reduce disturbance to mule deer foraging habitat. Proposed wellsites and roads may be relocated up to 200 feet, as described in 43 CFR 3101.1-2, to protect wildlife and reduce impacts to mule deer.
- Require 1.5 acres of mitigation for every acre of disturbance within browse habitat on 12,785 acres of BCRMP-identified crucial mule deer winter range.
- Close and rehabilitate unnecessary roads and trails.
- Avoid developing loop roads within UDWR-identified critical mule deer winter range.
- Allow no drilling within .5 mile of active golden eagle nests year-round. Follow other raptor timing and distance constraints as described in Chapter 2, Section 2.2.1.4.3. These restrictions would also apply to workover rigs. Work would be scheduled outside these timing restrictions.
- Site all locations as far from inactive raptor nests as possible. Attempt to topographically conceal the work locations and access roads from the nest.
- Construct artificial nesting sites (ANSs) to allow raptors to switch from natural to artificial nesting sites. The ANSs should be in place at least two years prior to any development occurring within .25 mile of a natural nest to allow the birds to either accept or reject the new structure. If the ANS is not used, development within the BLM-recommended spatial buffer of a natural nesting site should not be permitted, and work should be scheduled outside the recommended spatial and seasonal buffer zones.
- Conduct site-specific surveys for songbird and neotropical migratory bird nests, if construction takes place during the breeding season (April 1 through July 15). Conduct nest searches to clear areas prior to construction (SWCA 2002).
- Site all roads and well pads as far from permanent water sources as possible. New construction would be prohibited within .25 mile of Asphalt Wash, the flowing wells within Asphalt Wash, and the center fork of Asphalt Wash.

4.7.6.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

- Do not allow drilling of wells or construction of access roads from November 15 through April 15 on BLM-administered lands identified by the UDWR as critical mule deer winter range.
- Using the 200-m rule as described in 43 CFR 3101.1-2, relocate proposed wellsites and access roads within pinyon-juniper dominated habitat, where feasible, to reduce disturbance to mule deer foraging habitat.

- Require 1.5 acres of mitigation for every acre of disturbance within browse habitat on 33,694 acres of UDWR-identified critical mule deer winter range.
- Close and rehabilitate unnecessary roads and trails.
- Avoid developing loop roads within UDWR-identified critical mule deer winter range.
- Follow the recommended USFWS raptor timing and distance constraints as described in Section 2.3.1.3. These restrictions would also apply to workover rigs, and work would be scheduled outside these timing restrictions.
- Site all locations as far from inactive raptor nests as possible. Attempt to topographically conceal the work locations and access roads from the nest.
- Construct artificial nesting sites (ANSs) to allow raptors to switch from natural to artificial nesting sites. The ANSs should be in place at least two years prior to any development occurring within .25 mile of a natural nest to allow the birds to either accept or reject the new structure. If the ANS is not used, development within the BLM-recommended spatial buffer of a natural nesting site should not be permitted, and work should be scheduled outside the recommended spatial and seasonal buffer zones.
- Conduct site-specific surveys for songbird and neotropical migratory bird nests, if construction takes place during the breeding and nesting season (April 1 through July 15). Conduct nest searches to clear areas prior to construction (SWCA 2002).
- Site all roads and well pads as far from permanent water sources as possible. New construction would be prohibited within .25 mile of Asphalt Wash, the flowing wells within Asphalt Wash, and the center fork of Asphalt Wash.

4.7.6.4 ALTERNATIVE 4 – NO ACTION

Current mitigation measures would continue.

4.7.7 UNAVOIDABLE ADVERSE EFFECTS

4.7.7.1 ALTERNATIVE 1 – PROPOSED ACTION

- Direct loss of wildlife habitat for the life of the project, and longer, due to the length of time required for browse species to re-establish.
- Direct loss of an unquantifiable, but small number of small mammals, reptiles, and nesting songbirds from development activities and fragmentation of habitats.
- Direct loss of 158 acres of mule deer forage and habitat on RMP-designated crucial mule deer winter range.
- Direct loss of 260 acres of mule deer forage and habitat on UDWR-identified critical mule deer winter range.
- An undetermined loss of mule deer occurring on UDWR-identified critical winter range during the winter months due to development activities.
- Indirect loss of 59.5 acres of BCRMP-designated crucial mule deer winter range because of road development.

- Indirect loss of 154 acres of UDWR-identified critical mule deer winter range because of road development.
- Direct and indirect losses of forage and habitat for approximately 53 deer on RMP-designated crucial mule deer winter range.
- Direct and indirect losses of forage and habitat for approximately 139 deer on UDWR-identified critical mule deer winter range.
- Indirect effects on elk would include animal displacement, habitat fragmentation, reduced habitat value, and increased human harassment and poaching.
- Possible permanent abandonment of raptor nests within .25 mile of permanent facilities or roads if these are constructed during the non-breeding season.
- Fragmentation of raptor habitat and reduction in raptor prey base.

4.7.7.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

- Direct loss of wildlife habitat for the life of the project, and longer, due to length of time required for browse species to re-establish.
- Direct loss of an unquantifiable, but small number of small mammals, reptiles, and nesting songbirds from development activities and fragmentation of habitats.
- Direct loss of 255.6 acres of mule deer winter forage and habitat on UDWR-identified critical mule deer winter range.
- Indirect loss of 3,432 acres of BCRMP-identified crucial and UDWR-identified critical mule deer winter range through road development.
- Direct and indirect losses of forage and habitat for approximately 126 deer.
- Indirect effects on elk, including animal displacement, habitat fragmentation, reduced habitat value, increased human harassment, and poaching.
- Fragmentation of raptor habitat and reduction in raptor prey base.

4.7.7.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

- Direct loss of wildlife habitat for the life of the project, and longer, due to length of time required for browse species to re-establish.
- Direct loss of an unquantifiable number of small mammals, reptiles, and nesting songbirds from development activities and fragmentation of habitats.
- Indirect loss of 3,432 acres of BCRMP-identified crucial and UDWR-identified critical mule deer winter range through road development.
- Direct and indirect losses of forage and habitat for approximately 119 deer.
- Indirect effects on elk, including animal displacement, habitat fragmentation, reduced habitat value, increased human harassment, and poaching.
- Fragmentation of raptor habitat and reduction in raptor prey base.

4.7.7.4 ALTERNATIVE 4 – NO ACTION

- Direct loss of wildlife habitat would continue to occur from well pad and access road construction activities, though at a much slower rate than any of the other three alternatives.
- Direct loss of small mammals, reptiles, and nesting songbirds from construction activities and fragmentation of habitats.
- Direct loss of mule deer winter forage and crucial mule deer winter range, though at a diminished rate.
- An undetermined loss of mule deer from construction activities occurring on crucial winter range during the winter months, causing animal displacement, death, reduction in winter range carrying capacity, use of unfavorable or occupied habitat, and increased susceptibility to predation.
- Indirect loss of crucial mule deer winter range because of continued road development, leading to habitat fragmentation, animal displacement, loss of habitat value, increased energy expense, human harassment, poaching loss, and increased vehicle collisions.
- Direct and indirect losses of forage and habitat, reducing the remaining habitat's mule deer carrying capacity.
- Indirect effects on elk, including animal displacement, habitat fragmentation, reduced habitat value, increased human harassment, and poaching.
- Avoidance of permanent water sources and decreased water availability for resident elk and pronghorn.
- Abandonment of raptor nests during the nesting season, if wells or roads are constructed during the raptor nesting season.
- Possible permanent abandonment of raptor nests within 3 miles of permanent facilities or roads, if these are constructed during the non-breeding season.
- Fragmentation of raptor habitat and reduction in raptor prey base, but at an overall slower rate.

4.8 SPECIAL STATUS SPECIES

4.8.1 PLANTS

4.8.1.1 DIRECT AND INDIRECT EFFECTS

4.8.1.1.1 Alternative 1 – Proposed Action

Planned wells, associated roads, and pipelines would occur on 416 acres (1.2%) of the approximately 35,027 acres of habitat and potentially suitable habitat for Graham beardtongue and/or White River beardtongue occurring in the Project Area. The landscape would be fragmented by the development of the road and pipeline infrastructure, which could limit seed dispersal of Graham beardtongue and White River beardtongue, which in turn could lead to a reduction in population size and species distribution over time. Fragmentation of the landscape

and suitable habitat near roads and pipelines could indirectly impact the dispersal of seeds and limit the species distribution over time. Populations for these two species tend to fluctuate in numbers and are scattered over the range of suitable habitat. Occupancy of suitable habitat by these species varies over time due to reproductive success, insects and disease, age class distribution, and environmental factors. BMPs and the standard APD process could minimize the direct impacts on suitable habitat where plants occur at that time, via site-specific relocation of pads and roads. Suitable habitat that does not have plants at the time of surveys would be lost during the construction of well pads and roads.

Adverse effects on Graham beardtongue and White River beardtongue habitat and potentially suitable habitat include increased opportunity for habitat destruction and noxious weed seed dispersal associated with OHV traffic on the 127 miles of new roads proposed for construction within the Project Area.

4.8.1.1.2 Alternative 2 – Additional Wildlife Considerations

The impacts to special status plants by fragmentation of the landscape would be the same as Alternative 1. The loss of unoccupied but suitable habitat would be minimized by this alternative through the additional protection measure, which requires the avoidance of surface disturbance in special-status plant habitats.

4.8.1.1.3 Alternative 3 – Additional Environmental Considerations

The impacts to special status plants by fragmentation of the landscape would be the same as for Alternative 2, but slightly smaller in magnitude due to the lack of construction and road building in areas with wilderness characteristics.

4.8.1.1.4 Alternative 4 – No Action

This alternative has the greatest potential for disturbance to habitat for Graham beardtongue and White River beardtongue. Fragmentation of the landscape by roads, wells, and pipelines; potential of invasive weed species; and loss of potential habitat would be the greatest in this alternative, at least twice the impact of Alternatives 1 and 2.

Under Alternative 4, current land use practices, including existing oil and gas production, would be continued. In the future, additional wells could be drilled within the RDG Project Area at a rate anticipated in the Book Cliffs RMP and ROD (BLM 1985). Historically, wells have been drilled at an average rate of 2 to 5 wells per year since the ROD was signed in 1985.

4.8.1.2 MITIGATION

4.8.1.2.1 Alternative 1- Proposed Action

- Maintain suitable habitat in the development areas by moving roads and pads out of suitable habitat for Graham beardtongue and White River beardtongue.

- Conduct surveys for Graham beardtongue prior to construction. Where delineated suitable habitat and populations occur, modifications to the surface use plan may be required.
- Implement a road-signing program to limit access in those areas known to contain populations or suitable habitat for Graham beardtongue and White River beardtongue as determined by the AO. Implementation of an aggressive weed control program, in strict conformance with state and federal standards, would remove exotic vegetation, thereby improving habitat for native plants. Seeding roadsides and pad areas would reduce the likelihood that invasive weed species would become established.

4.8.1.2.2 Alternative 2 – Additional Wildlife Considerations

Same as Alternative 1.

4.8.1.2.3 Alternative 3 – Additional Environmental Considerations

Same as Alternative 1.

4.8.1.2.4 Alternative 4 – No Action

Current mitigation measures would continue.

4.8.2 WILDLIFE

4.8.2.1 DIRECT AND INDIRECT EFFECTS

4.8.2.1.1 Alternative 1 – Proposed Action

Bald Eagle

Sources of direct mortality of bald eagles include intentional or accidental shooting, poisoning, and collisions with vehicles. Wintering bald eagles feed on carrion; therefore, the potential exists for birds feeding along roadsides to be involved in vehicle collisions. As bald eagles tend to avoid areas of intense human activity during all times of year, development activities could temporarily displace eagles from winter foraging areas. Other, equally suitable, habitats are available that would provide bald eagles with undisturbed foraging and roosting areas.

Western Yellow-billed Cuckoo

This species is associated with large patches of riparian woodlands. The limited riparian habitat in the Project Area is unlikely to support a nesting pair. However, this limited riparian habitat could provide decent stopover habitat for this species during migration. Development activities could temporarily displace cuckoos from safe migration layover areas. Other, equally suitable, habitats are available that would provide cuckoos with undisturbed foraging and roosting areas.

Northern Goshawk

The northern goshawk is typically nests in higher elevations in mature conifer forests and aspen stands, and along valley cottonwood habitats (UDWR 1997b). However, winter habitat includes the lower-elevation pinyon-juniper woodlands. This species is known to occur within the Project Area, within the pinyon-juniper community during the winter season. As northern goshawks tend to avoid areas of intense human activity during all times of year, development activities could temporarily displace goshawks from winter foraging areas and negatively affect the winter habitat. Other, equally suitable, habitats are available that would provide northern goshawks with undisturbed foraging and roosting areas.

Ferruginous Hawk

Ferruginous hawks may occasionally (i.e., during periods of prey abundance) nest in the northern and western portions of the RDG Project Area. Project development within 2 miles of an active nest site may impact nesting birds. This species is particularly susceptible to human-caused disturbances during courtship and incubation periods. A breeding pair could be disturbed by project-related development, including direct habitat removal, prey-base reduction, noise, and increased human presence, possibly resulting in nest and territory abandonment. This would impact a breeding pair's productivity for that year, loss of nesting potential, and bird displacement. Additional impacts would include habitat fragmentation and a loss of foraging opportunities.

Greater Sage Grouse

Impacts to breeding greater sage grouse would be partially mitigated by the BMPs identified in the Proposed Action. These protection measures stipulate that no surface disturbance would be allowed within this designated area from March 15 to June 15, until presence/absence surveys are conducted to locate any active leks. If an active lek site is documented prior to ground disturbance, a permanent avoidance area should be established within 300 feet of the lek. However, impacts to breeding grouse may occur before March 15 and outside of the 300-foot buffer. Breeding birds may abandon breeding grounds if activities were to occur within 1,000 feet of an active lek from March 1 to March 15.

Development of 6 well pads and associated access roads in sagebrush-dominated habitat on Archy Bench would remove approximately 17.2 acres of sage grouse nesting habitat for the life of the project, and probably an additional 30 - 40 years beyond that, before sagebrush could be re-established to the point that grouse would select the area for nesting.

Short-eared Owl

Potential impacts to the short-eared owl from implementation of the Proposed Action would be limited to disturbance of breeding pairs, if present. Although this owl species is known to breed in the RDG Project Area, breeding incidence is likely low, and the amount of suitable nesting habitat is limited. If breeding birds occur in the vicinity of a wellsite or access road, increased noise and human presence associated with construction during the breeding season (April 10 to July 15) could disrupt nesting birds or directly impact nest sites by crushing. Disturbance of foraging habitat and reduction of prey species could impact nesting birds.

Burrowing Owl

Potential impacts to the burrowing owl would include habitat loss within the small, isolated white-tailed prairie dog colonies located in the northwestern portion of the RDG Project Area. Direct impacts would include crushing of den sites from well and road development, which would result in the loss of eggs, nestlings, or adult birds between April 1 and July 15. Burrowing owls appear to tolerate many types of human activity, including vehicular traffic and construction noises; however, it is assumed that disturbances near nest sites during the nesting period would influence nesting success (Marks and Ball 1981).

White-tailed Prairie Dog

Potential impacts to the white-tailed prairie dogs would potentially occur within the small, isolated white-tailed prairie dog colonies located in the northwestern portion of the RDG Project Area. Direct impacts would include crushing of burrows and loss of habitat from well and road development, and may result in collisions with vehicles. White-tailed prairie dogs appear to tolerate many types of human activity, including vehicular traffic and construction noises; however, the increased fragmentation of the colonies and increased vehicular activity would pose a threat to this species.

Colorado Pikeminnow, Razorback Sucker, Humpback Chub, Bluehead Sucker, Colorado River Cutthroat Trout and Bonytail

No effects to these species would be anticipated from increased sedimentation to the White River that may originate from any of the alternatives. The species are all adapted to turbid conditions, and it is unlikely that sedimentation caused by project actions would affect their survival.

RDG operators are proposing to use up to 5 acre-feet of surface water per year from Evacuation Creek for drilling purposes. This withdrawal from Evacuation Creek would result in a new source of water depletion from the Upper Colorado River Basin and may adversely affect the four endangered Upper Colorado River fish by virtue of this depletion (USFWS 1995b). The 1995 USFWS Biological Opinion regarding endangered Colorado River fish continues to govern new water depletions in the Upper Colorado River Basin (personal communication between L. England, USFWS, and D. Graf, ENSR on August 13, 1997). This Opinion determined that the Recovery Implementation Program Recovery Action Plan was deemed sufficient to serve as the reasonable and prudent alternative and would avoid the likelihood of jeopardy to these endangered fish species from new depletions of less than 3,000 acre-feet. In addition, the 1995 Opinion continued an exemption of the depletion fee for projects annually depleting less than 100 acre-feet of water. Formal Section 7 consultation between the BLM and USFWS is required for the Proposed Action.

4.8.2.1.2 Alternative 2 – Additional Wildlife Considerations

Protective measures for greater sage grouse and raptors incorporated into this alternative would reduce the likelihood of impacts occurring to Utah Species of Special Concern (see Chapter 2, Section 2.2.1.4.2); however, 17.2 acres of sage grouse nesting habitat would be lost for the duration of the project.

Impacts to endangered fish would be the same as described in 4.8.2.1.

4.8.2.1.3 Alternative 3 – Additional Environmental Considerations

This alternative would result in the same impacts as Alternative 2, except that the elimination of 50 wells in areas possessing wilderness characteristics and the implementation of the additional USFWS raptor protection guidelines would further reduce impacts to breeding and nesting raptors.

4.8.2.1.4 Alternative 4 – No Action

Wells would still be authorized within the Project Area, but at a reduced rate from either of the other alternatives. Any wells authorized on BLM-administered lands would still fall under the authority of the Endangered Species Act, and no actions would be authorized that would jeopardize the continued existence of any endangered, threatened, or candidate species, or result in the destruction or adverse modification of critical habitat for such species.

Protective measures for sage grouse and raptors would not be incorporated into this alternative and could result in adverse impacts to Utah Species of Special Concern, which may help to cause them to be listed, or proposed for listing, at some point in the future.

Under the No Action Alternative, current land use practices, including existing oil and gas production, would be continued. In the future, additional wells could be drilled within the RDG Project Area at a rate anticipated in the Book Cliffs RMP and ROD (BLM 1985). Historically, wells have been drilled at an average rate of 2 to 5 wells per year since the ROD was signed in 1985.

4.8.2.2 IMPACTS SUMMARY

4.8.2.2.1 Alternative 1 – Proposed Action

Direct and indirect impacts to wildlife from the Proposed Action are expected to include the following:

- Well pad and/or road construction within ferruginous hawk habitat may cause temporary abandonment by ferruginous hawks of their nests or territory during nesting season, possible permanent abandonment of nesting sites, and/or a reduction in the area's prey base.
- Well pad and/or road construction may cause disturbance in or elimination of strutting grounds between March 1 and March 15 within sage grouse habitat. These construction-related activities, if they encroach within 300 feet of a lek, may cause disruption of breeding activities. The Proposed Action would eliminate 17.2 acres of sage grouse habitat for the duration of the project as a result of the construction of six wells and their associated roads within sagebrush habitat.
- Construction activities within short-eared owl habitat, burrowing owl habitat, and migratory songbird habitat may cause disruption of breeding activities, possible destruction of nesting sites or abandonment of nesting sites.

- The use of approximately 5 acre-feet of water per year from Evacuation Creek for well drilling and completion purposes may contribute to the depletion of the Upper Colorado River System, requiring formal Section 7 consultation with the USFWS.

4.8.2.2.2 Alternative 2 – Additional Wildlife Considerations

The direct and indirect impacts caused by Alternative 2 would include:

- The elimination of 17.2 acres of sage grouse habitat for the duration of the project as a result of the construction of six wells and their associated roads within sagebrush habitat.
- The use of approximately 5 acre-feet of water per year from Evacuation Creek for well drilling and completion purposes. This water use may contribute to the depletion of the Upper Colorado River System, requiring formal Section 7 consultation with the USFWS.

4.8.2.2.3 Alternative 3 – Additional Environmental Considerations

The impacts would be the similar to Alternative 2, with additional habitat protection provided by the elimination of 50 wells in areas possessing wilderness characteristics and the implementation of USFWS raptor protection guidelines.

4.8.2.2.4 Alternative 4 – No Action

The impacts would be the same as Alternative 1, except that proportionally less water would be used per year for well drilling and completion purposes.

4.8.2.3 MITIGATION

4.8.2.3.1 Alternative 1 – Proposed Action

- To reduce the impacts on raptors, allow no drilling within .5 mile of ferruginous hawk nests from March 1 to July 15, and allow no permanent structures within .25 mile unless they are topographically screened or artificial nests have been adopted.
- Allow no new development activities within .25 mile of short-eared owl nests from April 1 to July 15, or within .25 mile of burrowing owl nests from April 15 to August 15.
- Allow no surface occupancy within .25 mile of any raptor nest while it is active.
- To reduce the impacts on sage grouse, allow no disturbance within greater sage grouse strutting and nesting habitat on Archy Bench between March 1 and June 30.
- Allow no permanent facilities within 1,000 feet of any identified greater sage grouse strutting ground.

4.8.2.3.2 Alternative 2 – Additional Wildlife Considerations

- Nesting raptors would be protected by restricting construction and ground-disturbing activities year-round within .5 mile of golden eagle nests that have been active within the past two years. However, surface-disturbing activities may be allowed within .25 mile of an active nest if a site-specific analysis determines that terrain features adequately protect the nest site from the proposed surface-disturbing activity.

- Construction and ground-disturbing activity would be restricted year-round within .5 mile of ferruginous hawk and bald eagle nests.
- Construction and ground-disturbing activity would be restricted year-round within 1 mile of known peregrine falcon nests.
- The above spatial and timing restrictions would not apply if impacts could be mitigated through other management actions. A site-specific analysis would be completed to determine if terrain and topographical features could adequately protect the nest site from proposed ground-disturbing activity. These timing and distance restrictions would also be applied to workover rigs.
- Based on the 1997 MSO habitat model, the BLM or a BLM-approved biologist would conduct site-specific field surveys for MSO within the fair habitat identified within the RDG Project Area. The surveys would be conducted according to FWS protocol. If necessary, timing and/or other restrictions would be employed to provide MSO protection (see Chapter 2, Section 2.2.1.4). Restrictions would be implemented after consultation with the USFWS.
- To protect other raptor species nest sites, no ground-disturbing activity would be allowed within .5 mile of an active nest during the specified timing constraints shown in Chapter 2, Table 2-5 (Section 2.2.1.4.3).
- No surface disturbance, drilling, or completion activities would be allowed within 1,000 feet of sage grouse strutting grounds.
- No surface disturbance, drilling, or completion activities would be allowed within 2 miles of active sage grouse strutting grounds during the breeding and nesting period by restricting those activities between March 1 and June 30. These timing and distance restrictions would also be applied to workover rigs. This restriction would not apply if sage grouse are not present (BLM 1994).
- No powerlines or electrical transmission lines would be built that provide perch sites for raptors within 2 miles (3 km) of sage grouse habitat. Transmission lines would be buried or power poles would be modified to prevent their use as raptor perches (Connelly et al. 2000).

4.8.2.3.3 Alternative 3 – Additional Environmental Considerations

The proposed mitigation would be the same as Alternative 2, except:

- To protect sage grouse, if an active lek site is documented prior to ground disturbance, a permanent avoidance area would be established within 400 yards of the lek (Hemker 1997). This would include avoiding the development of power lines, roads, and fences.
- No new facilities of any kind would be constructed within 0.6 mile (1 km) of leks to minimize disturbance during the breeding season (BLM 1994).
- Human activities of any kind in view of or within 0.3 mile (0.5 km) of leks would be minimized during early morning and late evening, when sage grouse are on or near leks (Connelly et al. 2000).

- The USFWS raptor nesting and spatial buffer guidelines and protection measures described in Section 2.3.1.3 would be used to minimize the effects of ground-disturbing activities on raptors nesting within the Project Area.

4.8.2.3.4 Alternative 4 – No Action

Current mitigation measures would continue.

4.8.3 Unavoidable Adverse Effects

All action alternatives would contribute to the loss of 17.2 acres of sage grouse nesting habitat from development of six wells and associated roads in sagebrush habitat. Water would also be depleted from the Upper Colorado River System.

4.9 Cultural Resources

The BLM has determined that the proposed project is a federal undertaking in accordance with 36 CFR 800 (regulations implementing provisions of Section 106 of the National Historic Preservation Act). Any federal undertaking must consider potential effects to significant historic properties and must conform to federal regulations (particularly 36 CFR 800) in determining effects that a project may have on significant cultural resources (36 CFR 60.4), and in the mitigation of effects determined to be adverse.

As defined in 36 CFR 800, adverse effects to significant historic properties would include physical alteration, damage, or destruction; alteration of the character of the setting of a property which contributes to its significance; or neglect resulting in deterioration or destruction. All of these classes of potential adverse effects are of concern for archaeological, historical, or Native American traditional resources.

4.9.1 Direct and Indirect Impacts

4.9.1.1 Alternative 1 – Proposed Action

In addition to the protection measures listed in Section 2.1.13.1 to avoid cultural resource impacts, all cultural resource concerns would be addressed at the site-specific level as part of the APD NEPA process and related Section 106 compliance work.

Cultural resources are sensitive and non-renewable resources that can be irreversibly damaged by ground disturbing activities, such as site and road construction, seismic operations, and by secondary surface activities, including vehicular and pedestrian traffic. Many archaeological sites in the general area of the project are shallow, and cultural deposits could be damaged or destroyed by vegetation clearing, ROW blading, or excavation of soils. Standing historic buildings or structures are more visible than archaeological deposits and are more easily avoided by ground-disturbing activities. Impacts to cultural sites and structures would be prevented or mitigated through the site-specific approach outlined previously.

Historic and prehistoric cultural resources may also be subject to increased indirect impacts, such as vandalism, surface artifact collection, excavation, and off-road traffic because of improved access to the area from new and upgraded roads. Indirect impacts may consist of inadvertent damage, destruction, or removal of significant scientific information, or destruction of the character or setting of a site. These indirect effects can be short-term or occur in the future when improved access is available. The RDG Project Area is already fairly well developed with access roads and trails, and the above indirect effects may be unintentionally exacerbated by road improvements and road building proposed by RDG operators. However, neither the Proposed Action nor the alternatives authorize these acts.

Site density of cultural resources in the area has been statistically estimated at 0.4 - 1.76 sites per square mile (Williams et al. 1983). Based on these estimates, 50 to 216 cultural resource sites could occur in the RDG Project Area. Accurate depiction of vegetative biomes is necessary to complete such a predictive model, but those data are unavailable. Furthermore, at the programmatic level of planning and analysis in this EIS, the exact location of wells and access roads remains unknown. While the impacts to potential cultural sites cannot be quantified, the resource distribution is relatively sparse, which would tend to minimize the risk of direct and indirect impacts.

Twenty-one known historic sites, given their visibility and marketability for certain items, may be subject to more impacts from artifact collection than lower visibility sites (e.g., prehistoric sites and sites whose nature does little to lend themselves to vandalism, gilsonite trenches, etc.). Petroglyphs known to be in the Project Area may be subject to vandalism.

Impacts could result in the loss of research potential or enhancement through scientific study, loss of recreational opportunities and interpretation, loss of management options for the BLM, or alienation of place, setting, and feeling. The threat to these sites would depend upon their location relative to proposed new access roads, and upon efforts taken by the BLM and RDG operators to minimize or eliminate the threats at the time that a well, pipeline, road, or other project-related facility is considered.

The site-specific analyses for cultural resource protection and mitigation during the APD NEPA process would reduce the probability of adverse disturbances to cultural resource sites. In the unlikely event that these mitigation measures cannot be applied to cultural resources during construction, then the disturbance of sites, areas, and resources that are important to Native American peoples would have an adverse effect on traditional cultural values. The adverse impact would arise from the destruction of these sites and areas and resources, the loss of religious values, and the loss of areas in which tribal members conduct culturally important practices. There would also be a loss of ethnic identity and history, which may alienate the bands from their past and their ties to the land.

4.9.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Impacts would be the same as describe for the Proposed Action in Section 4.9.1.

4.9.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Impacts would be the same as described for the Proposed Action, but proportionally less, based on the reduced number of constructed wellsites, roads, pipelines, and support facilities under this alternative.

4.9.1.4 ALTERNATIVE 4 – NO ACTION

Impacts would be the same as those described for the Proposed Action and action alternatives, but the scope and scale would be proportionally less than all action alternatives, based on fewer wells being drilled with associated access roads, pipelines, and support facilities.

4.9.2 IMPACTS SUMMARY

4.9.2.1 ALTERNATIVE 1 – PROPOSED ACTION

Losses to archaeology, local and regional prehistory and history, and Native American values and traditional cultural properties would be minimized due to the BMPs.

4.9.2.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

The impacts would be similar to those described for the Proposed Action.

4.9.2.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Compared with the impact potential for Alternatives 1 and 2, the reduction in the number of wells (e.g., no construction in the White River inventory area and the UWC proposed wilderness units) would decrease the probability for impacts to cultural resources.

4.9.2.4 ALTERNATIVE 4 – NO ACTION

Current conditions and land use practices would continue. It is assumed that loss of cultural resources, if any, would occur at the same rate as at present. It is also assumed that current procedures implementing NEPA and the various antiquities acts and Native American acts would keep losses to a minimum.

4.9.3 MITIGATION

Adverse effects would be mitigated through a combination of research, avoidance, preservation in place, and interpretation. If a site cannot be avoided or protected, an authorized study would be conducted by archaeologists to provide data important on understanding the prehistory of the area.

Tribal governments, groups, and traditional authorities would be consulted during the site-specific mitigation process. Other interested parties, including the Utah State Historic

Preservation Office and the Advisory Council on Historic Preservation, would be consulted per regulation. Studies, whether scientific, i.e., archaeological, paleontological, or ethnographic, could be done, as necessary, under the aforementioned constraints and authorities. The same would apply to architectural and engineering studies implemented as a part of the mitigation process.

Mitigation would be appropriate to the scope of the Proposed Action, the nature of the resource at risk, and adherence to the provisions of 36 CFR 800 and other regulatory guidelines. Consultation with Native American governments, traditional leaders, and persons would also be done as a part of the mitigation process. Other interested groups and persons will also be consulted during the mitigation process.

4.9.4 UNAVOIDABLE ADVERSE EFFECTS

Those impacts that cannot be addressed by site-specific analysis and mitigation as outlined above would cause loss to the programs and resources listed for this section (archaeology, local and regional prehistory and history, and Native American values and concerns).

The rate, extent, intensity, and duration of loss due to non-recognition, lack of information and documentation, erosion, casual collection, and inadvertent destruction or use cannot be quantified at this time due to a lack of data. As a part of natural environmental processes, archaeological sites would be exposed, remain for a time, and become lost to history if not recorded or studied. Implementation of the Proposed Action or alternatives may cause losses over and above the natural attrition rate, but such losses cannot be quantified at this time.

4.10 PALEONTOLOGICAL RESOURCES

4.10.1 DIRECT AND INDIRECT EFFECTS

4.10.1.1 ALTERNATIVE 1 – PROPOSED ACTION

Collection and illegal excavation of vertebrate fossils may occur. Inadvertent damage may arise from construction of well pads, access roads, and gathering lines. Increased access in and around the RDG Project Area may increase the incidence of illegal collection and excavation. These adverse environmental impacts are unlikely, given the scarcity of fossil occurrences within the RDG Project Area (personal communication with L. Bryant, BLM Regional Paleontologist, March 2003). However, a treatment plan and mitigation and monitoring procedures, as described in BLM Manual H-8270-1 (BLM 1998a), would greatly reduce the probability of construction-related damage to the resource. As mentioned in Section 2.1.13.2 Paleontological Resources, construction workers would be educated in the importance of not collecting or vandalizing paleontological resources discovered during construction or operation of wellsites.

4.10.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Impacts would be the same as described in Section 4.10.1.1.

4.10.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Impacts would be the same as described in Section 4.10.1.1, but the scope and scale would be proportionally reduced, based on 50 fewer wells being drilled with associated access roads, pipelines, and support facilities.

4.10.1.4 ALTERNATIVE 4 – NO ACTION

Impacts would be the same as Section 4.10.1.1 but the scope and scale would be proportionally reduced based on fewer wells being drilled with associated access roads, pipelines, etc. Additional impacts would be possible, as a paleontological treatment plan would not be implemented.

4.10.2 IMPACTS SUMMARY

4.10.2.1 ALTERNATIVE 1 – PROPOSED ACTION

Losses to paleontological resources would be kept to a minimum due to the implementation and adherence to the paleontology treatment plan. The probability for loss would be low due to these administrative documents, the adherence by the BLM and energy personnel to the provisions of these documents, and the scarcity of fossil occurrences within the RDG Project Area.

4.10.2.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Same as Alternative 1.

4.10.2.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

A slight proportional decrease in the probability for loss of paleontological resources could occur under this alternative as compared with the impact potential for Alternatives 1 and 2.

4.10.2.4 ALTERNATIVE 4 – NO ACTION

Current conditions and land uses would continue. It is assumed that loss of paleontological resources, if any, would occur at the same rate as at present. It is also assumed that current procedures implementing NEPA may keep losses to a minimum.

4.10.3 MITIGATION

As described in Chapter 2 (see Section 2.1.13.2), a qualified paleontologist would assess and make recommendations for mitigation of damage to or destruction of paleontological resources in the RDG Project Area. Prior to any surface disturbance within the RDG Project Area and as determined by the BLM AO, paleontology surveys will be conducted on site-specific applications. Limited paleontological surveys would be conducted in Condition 2 areas, and none would be conducted in Condition 3 areas. Any vertebrate fossils discovered during construction

activities would be protected, and arrangements made for their significance and/or recovery. Fossils and data collected would be placed in an approved repository.

4.10.4 UNAVOIDABLE ADVERSE IMPACTS

The scarcity of fossil occurrences within the project is expected to greatly reduce the probability of unavoidable adverse impacts to the resource. However, loss due to non-recognition, lack of information and documentation, erosion, casual collection, and inadvertent destruction or use could cause losses. As a part of natural environmental processes, paleontological localities would be exposed, remain for a time, and become lost to history if not recorded or studied. The Proposed Action and alternatives may cause losses over and above the natural attrition rate but such losses cannot be quantified at this time.

4.11 LAND USE

The RDG Project Area consists of state, public, and private lands. Land uses are primarily for livestock grazing, mining, oil and natural gas development, recreation, and wildlife habitat. Direct effects on land uses would result from the removal of land from existing uses by the proposed RDG project gas exploration and extraction facilities, new roads, and pipelines. Indirect effects would include the impacts on existing land uses to private lands within the RDG Project Area.

4.11.1 DIRECT AND INDIRECT EFFECTS

4.11.1.1 ALTERNATIVE 1 – PROPOSED ACTION

Under the Proposed Action, disturbance (including well pads and roads) would total 1,222 acres. Short-term disturbance would total 355 acres. The long-term disturbance area for the proposed 423 wells on BLM-managed lands (including roads and gas-producing wells) would total 867 acres, since disturbed land required for construction of the well pads would be reclaimed. Land would be removed from existing rangeland uses, recreation, and wildlife habitat around the 423 proposed wells, for the 20-year production lifetime of each well. All proposed well locations would be examined by the BLM to determine if the site would interfere with existing mining, grazing, or other activities. If present, efforts for all the alternatives would be made to avoid existing activities by relocating well pads or roads, which would minimize the impacts.

The impacts to the transportation system and traffic levels in Uintah County would be long term and construction-related. Project-related traffic would not conflict with existing traffic or existing road uses.

There are no project facilities proposed for private within the RDG Project Area, so the rights of private property owners would not be affected by any phase of the proposed project. The subsequent location of any proposed facility on private land, and any mitigation required for each facility, would be negotiated with individual property owners.

All actions would be conformance with multiple use federal land management plans covering the RDG Project Area. As described in Section 3.13.5.1, Recreation, the Recreational Opportunity Spectrum (ROS) area no longer occupies any portion of the RDG Project Area, and thus, there are no RMP recreation management restrictions or management conditions within the RDG Project Area. A land management plan has been implemented by Uintah County, and the proposed alternatives would be compatible with the county.

4.11.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Alternative 2 would be similar to Alternative 1.

4.11.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Under Alternative 3, additional environmental considerations would reduce total land disturbance for the proposed 373 wells to 1,078 acres. Short-term disturbance would be approximately 313 acres. Long-term land disturbance (including roads and well pads) would be reduced to approximately 765 acres, since disturbed land required for construction of the well pads would be reclaimed.

4.11.1.4 ALTERNATIVE 4 – NO ACTION

There would be no change in existing land use conditions within the RDG Project Area.

4.11.2 IMPACTS SUMMARY

The majority of land use within the RDG Project Area is associated with grazing, mining, oil and gas development, and recreation. The maximum disturbance within the RDG Project Area would be under Alternatives 1 and 2 would be approximately 1,222 acres, and then reduced to a long-term disturbance of 867 acres after well pad construction reclamation. Alternative 3 – Additional Environmental Considerations would produce approximately 1,078 acres of disturbance, reduced to long-term disturbance of approximately 765 acres after well pad reclamation. Most disturbances would occur on grazing lands. Traffic would increase, with an increase in the potential for traffic accidents.

4.11.3 MITIGATION

All roads constructed across BLM-managed lands should be constructed to BLM standards.

4.11.4 UNAVOIDABLE ADVERSE EFFECTS

There would be unavoidable effects from noise with the use of roads and lands (see Section 4.17, Noise). The potential for traffic accidents would increase. The increased traffic accident potential would be greatest during exploration and well pad construction.

4.12 LIVESTOCK

4.12.1 DIRECT AND INDIRECT EFFECTS

4.12.1.1 ALTERNATIVE 1 – PROPOSED ACTION

The Proposed Action would cause the direct removal of vegetation on 1,222 acres, which would be replaced with project facilities. Of the 1,222 acres, approximately 355 acres would be subject to short-term disturbance, as they would be reclaimed following drilling/completion activities. A total of 867 acres would remain subject to long-term disturbance. The long-term loss of vegetation would result in the loss of 86 Animal Unit Months (AUMs) across the RDG Project Area (using 10 acres per AUM—the average stocking rate for the 5 affected allotments), which is 0.015% of the total active AUMs in the RDG Project Area.

The 86 AUMs would be lost for the lifetime of the project plus an additional 30–40 years, until the disturbed areas are revegetated to near pre-disturbance levels and forage lost during gas facility construction and operation is restored.

Under the Proposed Action, a long-term indirect effect exists for the introduction and establishment of noxious weeds where gas exploration and construction operations take place. Noxious weeds are generally not useful as livestock forage, and unless actively controlled, noxious weeds could become a problem for livestock managers.

As the road network is increased, the long-term potential for collisions between vehicles and livestock, and general disturbances of livestock, would increase.

4.12.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

In addition to the mitigation measures under the Proposed Action, mitigation or enhancement of 1.5 acres could be required for every acre of surface disturbance of browse habitat located inside mule deer crucial winter range. The BLM can require mitigation within the disturbed areas of the proposed site; however, the BLM cannot require mitigation to take place off-site. The RDG operators may volunteer to contribute to off-site mitigation or enhancement within UDWR-identified critical deer winter range. The long-term enhancement of 1.5 acres of habitat for every acre of disturbed critical winter range habitat would result in less of a long–term, negative effect on deer—and by extension, livestock—in and around the Project Area than the restoration measures required under Alternative 1.

The potential for long-term, indirect impacts to grazing could occur if noxious weeds become established in areas disturbed by gas exploration and construction activities. Establishment of noxious weeds would lead to a long-term decline in the more desirable forage species, resulting in a decline in available livestock forage.

4.12.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Under Alternative 3 would be the direct removal of vegetation on 1,078 acres, which would be replaced with project facilities. Of the 1,078 acres, approximately 313 acres would be subject to short-term disturbance, as they would be reclaimed following drilling/completion activities. Approximately 765 acres would remain under long-term disturbance. The long-term loss of 765 acres of vegetation would result in the loss of 76 AUMs across the RDG Project Area (using 10 acres per AUM, which is the average stocking rate for the 5 affected allotments).

The 76 AUMs would be lost for the life of the project plus an additional 30-40 years, until the disturbed areas are revegetated to near pre-disturbance levels and forage lost during gas facility construction and operation is restored.

The potential for long-term, indirect impacts to grazing could occur if noxious weeds become established in areas disturbed by gas exploration and construction activities. Establishment of noxious weeds would lead to a long-term decline in the more desirable forage species, resulting in a decline in available livestock forage.

As the road network is increased, the potential for collisions between vehicles and livestock, and general disturbances of livestock would increase.

4.12.1.4 ALTERNATIVE 4 – NO ACTION

Under this alternative, 2 to 5 wells per year could be drilled in this area, and additional roads could be constructed on federal lands to access state and private leases. With 5 wells drilled per year, there would be the direct loss of 14.4 acres per year, with approximately 10.2 acres lost for the long term. This would result in the loss of 1 AUM each year, which would have very little effect on the ongoing livestock operation. Over time, reclamation of abandoned wells would be initiated, and within 20 to 30 years following reclamation, the forage initially lost to development would be replaced, assuming successful reclamation and timely weed control.

The potential for vehicle and livestock collisions and livestock harassment would remain at existing levels.

4.12.2 IMPACTS SUMMARY

Under Alternatives 1 and 2, 86 AUMs would be lost for the lifetime of the project, plus an additional 30 – 40 years, until the disturbed areas are revegetated to near pre-disturbance levels and forage lost during gas facility construction and operation is restored. Under Alternative 3 – Additional Environmental Considerations, 76 AUMs would be lost for the life of the project, plus an additional 30 – 40 years, until the disturbed areas are revegetated to near pre-disturbance levels and forage lost during gas facility construction and operation is restored. Alternative 4 would cause the loss of 1 AUM each year, which would have very little effect on the ongoing livestock operation.

4.12.3 MITIGATION

The impacts from an increase in undesirable and noxious weeds could be mitigated by using the mitigation measures described in the Section 4.5.3, Vegetation.

4.12.4 UNAVOIDABLE ADVERSE EFFECTS

Disturbances of vegetation would remain an unavoidable, adverse impact to livestock management for all of the alternatives. There would be an increased potential for livestock/vehicle collisions under all of the alternatives. The loss of 86 AUMs for the lifetime of the project under the Proposed Action and Alternative 2 – Additional Wildlife Considerations would be an unavoidable adverse impact on livestock management, as would be the loss of 76 AUMs under Alternative 3. Alternative 4 would result in 1 AUM lost per year, or 20 AUMs lost over a twenty-year project time period.

4.13 RECREATION

The potential effect of the RDG project on recreation resources is based on a balance between how much recreational opportunity would be lost and how much recreational opportunity would be created by the project. At present, the RDG Project Area is unpopulated and rural, with some visual modifications caused by existing gas wells. The facilities and structures proposed by the RDG operators would create an intrusion that could have an impact on recreationists within the area, particularly those who might be seeking solitude and quiet. Construction operations could also have an effect on recreational opportunities by restricting or changing access to recreational opportunities and by directly disrupting existing recreational opportunities.

Direct impacts to recreation resources would occur if the project causes acres presently being used for recreation to be devoted to natural gas exploration and development. Construction impacts would be important if recreational opportunities were changed, or if BLM recreational objectives for the area were not met.

Indirect impacts would occur if the proposed project caused a change in visitation to the area.

4.13.1 DIRECT AND INDIRECT EFFECTS

4.13.1.1 ALTERNATIVE 1 – PROPOSED ACTION

The proposed expansion of the road network would allow hunters and OHV operators to use more extensive portions of the RDG Project Area. OHVs in the Book Cliffs are predominantly used for hunting big game. This area is not used extensively because it is not in the elk crucial range, but it does receive increased use because of the high quality of mule deer that can be found throughout the RDG Project Area. However, the increase in drilling- and production-related vehicle traffic would also act as a deterrent to some hunters.

People who hike more than 1.5 miles south beyond the Goblin City Overlook would encounter roads, facilities, and occasional vehicle service traffic. Others, however, could use the road network to access remote hiking areas.

The construction of pipelines larger than 4 inches in diameter would pose an obstacle to motorized vehicles accessing and traversing the RDG Project Area, especially fire suppression crews in light trucks and occasional firewood cutters in pick-ups carrying heavy loads on their vehicles.

Short-term impacts would be produced during all phases of gas exploration and development. Noise, dust, loss of solitude, and a degradation of visual quality would be evident, and construction vehicle traffic could potentially conflict with recreational traffic.

4.13.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

The impacts to recreational opportunities and resources would similar to those described for the Proposed Action. Under this alternative, the same number of wells (423) would be drilled in the RDG Project Area. Short-term impacts would be produced during all phases of gas exploration and development. Noise, dust, loss of solitude, and a degradation of visual quality would be evident, and construction vehicle traffic could potentially create conflicts with recreational traffic. However, noise, dust, and construction-related traffic would be greatly reduced during those periods when construction activities are restricted, and between May 15 and June 30 when no construction or drilling operations would be allowed within the 5-mile Goblin City Overlook viewshed (see Section 2.2.1.6). This would improve recreational opportunities during this time, both for land-based recreational activities and float trips on the White River.

The construction of pipelines larger than 4 inches in diameter would pose an obstacle to motorized access, especially fire suppression crews in light trucks and occasional firewood cutters in pick-ups carrying heavy loads on their vehicles. OHV use and access, both on road and off, would continue to occur.

4.13.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Under Alternative 3, additional timing restrictions would be placed in effect for the mule deer winter range, and areas that possess wilderness characteristics would not be directly impacted by natural gas exploration and development. However, well pads, wells, and associated infrastructure associated with gas drilling and production would be visible to hikers, hunters, and OHV users throughout the RDG Project Area. In the short term, noise, dust, and construction-related traffic would be greatly reduced during those periods when construction activities are restricted.

People who hike more than 2 miles south (the distance is increased to 2 miles under this alternative because there are fewer wells being drilled near the Goblin City Overlook), beyond the Goblin City Overlook, would encounter roads, facilities, and occasional vehicle service traffic. Others, however, may use the road network to access remote hiking areas. More off-road use would most likely occur because of fewer roads built in comparison to the Proposed Action

and Alternative 2, but between May 15 and June 30, when no construction or drilling operations would be allowed within the 5-mile Goblin City Overlook viewshed (see Section 2.2.1.6), short-term effects such as noise, dust, and construction-related traffic would be greatly reduced in this area. This would enhance recreational opportunities during this time, both for land-based recreational activities in this area and float trips on the White River.

The construction of pipelines larger than 4 inches in diameter would pose an obstacle to motorized access, especially fire suppression crews in light trucks and occasional firewood cutters in pick-ups carrying heavy loads on their vehicles. OHV use and access, both on road and off, would continue to occur.

The preservation of wilderness characteristics under this alternative would maintain the existing opportunities for remote, dispersed recreational activities, and the opportunities for solitude. These opportunities would be maintained within the White River inventory area and the UWC proposed wilderness units that the BLM has determined likely have wilderness characteristics.

4.13.1.4 ALTERNATIVE 4 – NO ACTION

No changes in access would occur under the No Action Alternative. Hunters, OHV users, and other recreationists would continue to rely on the existing road network. Hikers would either have less opportunity to access remote areas because of fewer roads compared to the Proposed Action, but the amount of undisturbed natural landscape would remain at current levels.

OHV use and access, both on-road and off, would continue to occur. More off-road use would most likely occur because of fewer roads, and this would provide opportunities to explore where others have not been. Remote camping would continue to occur without the areas, with the occasional disturbance of other recreationists that might have had motorized access to more areas if other, more development-intensive alternatives were implemented. The sense of remoteness would remain as it is now. The viewing of natural landscapes would also not be diminished.

4.13.2 IMPACTS SUMMARY

The construction of new natural gas wells would require the construction of new roads and the installation of pipelines. The roads would be of benefit to some by providing them with increased access, but they would be an intrusion to others who would be losing relatively undisturbed, roadless areas. The pipelines, if kept at a 4-inch diameter or less, would pose little difficulty or act as obstacles to OHV users. Noise and dust at construction sites and along access roads would affect the recreational experience for all alternatives, but restrictions under Alternative 2 – Additional Wildlife Considerations and 3 would reduce these short-term impacts from May 15 through June 30 in the Goblin City Overlook area. Additional wilderness characteristics preservation under Alternative 3 – Additional Environmental Considerations would maintain the remoteness and solitude-related recreational opportunities in the White River inventory area and the UWC proposed wilderness units. Recreational solitude would be affected for the lifetime of the project by the presence of well pads and gas development facilities in all other areas. The natural setting would be affected by gas development facilities for the lifetime of the project.

4.13.3 MITIGATION

Pipelines would be buried beneath road crossings and in other locations as determined by the BLM AO. Because long-distance and larger diameter pipelines have prevented motorized access, segments of the pipeline would be buried to allow OHVs, firewood cutters, and fire suppression crews to cross the pipeline. Burial of pipe would be done to provide a 15-foot-wide, level travel surface and would be constructed at areas that could accommodate all three of the above user groups. The pipeline road crossings would be buried and not bermed because, over time, the bermed material would weather away. The crossings would be determined by a BLM representative and may occur at intervals of approximately one-half mile. This action would partially mitigate impacts on the above users.

4.13.4 UNAVOIDABLE ADVERSE EFFECTS

The increase in road construction into undeveloped areas would diminish the amount of natural landscape. Changes caused by natural gas development, such as the loss of solitude and an alteration of the landscape, would be unavoidable. The recreational loss of solitude would be unavoidable near construction areas, and to a lesser extent in other RDG Project Areas, during the lifetime of the project.

4.14 VISUAL RESOURCES

The construction and maintenance of natural facilities and roads would have an effect on the existing physical setting and alter the visual quality of the landscape. Direct impacts would occur as a result of project activities and the addition of proposed gas drilling and maintenance facilities, roads, pipelines, and vehicles. The proposed natural gas exploration and development in the RDG Project Area would introduce new elements into the landscape, which in turn would alter the form, line, color, and texture of the existing landscape. This alteration would be important if the introduced visual elements modify the landscape beyond the allowed limits prescribed by the BLM visual resource management (VRM) system classification for the area.

A 5-mile radius viewshed, generated by a computer-aided line-of-sight analysis, was used to identify impacts associated with the location or placement of wells, production facilities, and roads as identified from the Goblin City View Area KOP (elevation 5,665 feet) within the northern portion of the RDG Project Area.

The BLM undertook an in-depth viewshed analysis in order to determine the extent of the landscape that is visible from the Goblin City View Area. This analysis was accomplished through map interpretation, field reconnaissance by the BLM recreation specialist, and the use of a computer-generated "seen area analysis" that mapped the extent of the landscape that would be visible to an observer within 5 miles of the view area. The location of proposed wells and access roads were added to the "seen area" map in order to illustrate those facilities that could be visible from the view area (see Map 2-7).

An interdisciplinary team re-inventoried the area surrounding the Goblin City Overlook in April of 2000. This new area was mapped as VRM Class II. In this document, it is referred to as the

"re-inventoried VRM II Area." It is important to include this area for analysis because although it is not identified in the current Book Cliffs RMP, this is a new activity and user group area for experiencing a historic overlook within the Project Area.

4.14.1 DIRECT AND INDIRECT EFFECTS

4.14.1.1 ALTERNATIVE 1 – PROPOSED ACTION

Well pads, wells, and associated infrastructure associated with gas drilling and production would be visible to hikers, hunters, and OHV users throughout the RDG Project Area. The presence of these facilities would be consistent with BLM VRM Class IV objectives, which allow for modifications of the landscape that may dominate the view and be the major focus of viewer attention.

Under this alternative, and following the field inventory, which was performed in March 2000 from the Goblin City View Area, a total of 7 well pads or access roads could be seen (as determined by computer analysis) within the re-inventoried VRM Class II Area.

Short-term visual impacts would occur during well drilling and completion operations. This would not impact the re-inventoried VRM Class II area because it is considered short-term. However, the presence of side cutting on hillsides, the appearance of roads and well pads would diminish the "A" quality scenery as was inventoried. Drill rigs (derricks), workover rigs and their associated equipment, and plumes of dust and equipment exhaust would be visible from the Goblin City Overlook primarily from the drilling phase throughout the 10-20 year life of the proposed drilling program. Although these impacts would be acceptable under both VRM Class II and Class IV objectives, the presence of multiple drilling derricks at any one time would diminish visitor expectations of a remote and natural experience at the Goblin City View Area.

The BLM's viewshed analysis determined that a total of 11 proposed well pads (all along ridgelines) and 16 segments of proposed access roads (12 along ridgelines and 4 in draws) would be located in areas visible from the Goblin City View Area (see Map 2-7). Of this total, 4 proposed well pads (all along ridgelines) and 5 segments of proposed access roads (two along ridgelines) would be located on state lands (Table 4-2). All of these proposed facilities would be located at distances greater that 1.75 miles from the view area, with the exception of one short road segment located in Saddletree Draw in Section 32 of T10S, R23E.

Gas-producing well pads, sited either in draws or on side slopes, generally would not be noticed by the casual observer unless he/she was at higher elevations looking down onto them. Well pads could be visible in locations where mineral soil of a color different from the surrounding landscape were exposed, or if production facilities were not low in profile and painted a contrast-reducing color such as juniper green. Access roads located on side cuts within 5 miles of the View Area would be expected to produce visual contrasts with the natural landscape. The presence of access roads within the main washes would not contrast with the landscape because two roads currently are visible north of the RDG Project Area within Saddletree Draw and Atchees Wash. Given these criteria, portions of 12 access roads associated with the Proposed

Action (including two on state surface) would be visible from the view area and could contrast with the natural landscape. The locations of these roads are listed in Table 4-2.

Table 4-2. Facilities Proposed within the 5-mile Goblin City Seen Area

Section	Quarter-Quarter Section	Proposed Facility	Topographic Location	Surface Ownership
T11S, R23E				
1	NW of SW	Access road [1]	Side Slope	BLM
2	NW of NW	Access road	Draw	State
		Well pad	Ridge	State
2	NW of NE	Well pad	Side Slope	State
2	NW of SE	Access road [1] [2]	Side Slope	State
2	NW of SW	Access road [1]	Side Slope	State
2	SW of SE	Access road	Draw	State
2	SE of SE	Well pad	Side Slope	State
3	NW of NW	Access road [1]	Side Slope	BLM
5	NW of NE	Access road [1]	Side Slope	BLM
5	SW of SE	Access road [1]	Side Slope	BLM
5	SE of SW	Access road [1]	Side Slope	BLM
		Well pad	Side Slope	BLM
8	NW of NE	Access road [1]	Side Slope	BLM
		Well pad	Side Slope	BLM
11	NE of NE	Access road [1] [2]	Side Slope	BLM
11	NW of NE	Access road	Draw	BLM
11	NW of SE	Well pad	Side Slope	BLM
11	SE of SE	Well pad	Side Slope	BLM
14	NW of NE	Well pad	Side Slope	BLM
14	NW of SE	Access road [1]	Side Slope	BLM
		Well pad	Side Slope	BLM
16	NW of NW	Well pad	Side Slope	State
17	SE of NE	Access road [1]	Side Slope	BLM
T10S, R23E				
32	SE of NW	Access road	Draw	State
T11S, R22E				
1	NW of NE	Well pad	Side Slope	BLM
12	SE of NW	Access road [1]	Side Slope	BLM

[1] Portions of access roads that could be expected to contrast with the surrounding landscape.

[2] Portions of access roads greater 0.2 mile in length that could create a strong linear contrast with the surrounding landscape.

The presence of these road segments would each be less than 0.1 mile and would not be concentrated in any one location and, therefore, would not be expected to draw viewer attention. The remaining two road segments that would be visible (one on state surface) could create linear contrast that could be noticed by the casual observer, although the road segment proposed in Section 11 of T11S, R23E would run parallel to the viewing angle, thus minimizing its visual impact. The presence of these intermittent and winding road segments would each be along a ridgeline, throughout 10-foot-tall juniper tree areas. The roads and wells would not be concentrated in any one location and, therefore, would not be expected to draw viewer attention. Night lighting of the wells would have an impact on visual quality; however, only night hikers to the Goblin City View Area or those people hunting, riding or hiking near the well rigs (within 2 miles) would be affected.

The final locations of wells and roads on BLM lands would be determined when the individual APDs are filed with the BLM and the on-site inspections are conducted. As indicated in Section 2.1.13.7, RDG operators would attempt to locate these facilities out of direct line-of-site from the Goblin City View Area. The BLM AO would then review the proposed locations and ensure use of any available screening mitigation to reduce visual impacts. The BLM would not make determinations for well locations on state or private lands.

The visual impacts produced by the increased construction of well pads and their associated facilities, as well as roads and pipelines, would diminish the visual quality of the landscape. The homogenous and rather large blocks of similarly vegetated land patterns would be visually broken up by the linear construction of new roads, creating heightened visual contrasts. The viewshed would be further altered by the construction of well pads that would remove more vegetation and have a similar effect. The contrasts in both color and texture between the project-altered areas and undeveloped areas would be the most visually noticeable. These negative changes, however, would not exceed the VRM IV classification with which most of the RDG Project Area has been designated.

4.14.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Under this alternative, the same number of wells would be drilled as under the Proposed Action, with similar visual impacts as described for the Proposed Action. However, environmental mitigation incorporated into this alternative would prevent construction, drilling, and completion operations within the 5-mile viewshed of the Goblin City View Area from May 15 to June 30, which would reduce short-term visual impacts associated with fugitive dust in this area. Well pads, wells, and associated infrastructure associated with gas drilling and production would be visible to hikers, hunters, and OHV users throughout the RDG Project Area. The presence of these facilities would be consistent with BLM VRM Class IV objectives that allow for modifications of the landscape that may dominate the view and be the major focus of viewer attention.

The visual impacts brought on by the increased construction of well pads and their associated facilities, as well as roads and pipelines, would diminish the quality of the natural landscape. The fragmentation of homogenous and rather large blocks of similar vegetated land patterns would be broken by the linear construction of new roads. The viewshed would be further altered by the

construction of well pads that would remove more vegetation and have a similar effect. The difference in both color and texture to the altered areas would be the most visually noticeable. These negative effects, however, would not exceed VRM Class IV with which the RDG Project Area has been designated. Night lighting of the wells would have an impact on visual quality; however, only night hikers to the Goblin City View Area or those people hunting, riding or hiking near the well rigs (within 2 miles) would be affected.

4.14.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Under Alternative 3, 50 well pads, roads, and support facilities would not be constructed within the White River inventory area and the UWC proposed wilderness units, and the environmental restrictions for the Goblin City View Area (as described for Alternative 2) would be in effect from May 15 through June 30. The Goblin City View Area environmental restrictions would have short-term beneficial effects by reducing visual impacts associated with fugitive dust in this area during this time period. In general, the restrictions on natural gas exploration and development in the UWC wilderness units and the BLM's White River inventory area would have long-term, beneficial effects by preserving wilderness characteristics associated with scenic quality. Specifically, the 15 wells proposed for construction in the White River inventory area under the Proposed Action and Alternatives 2 and 4 would not be built under the environmental restrictions imposed by Alternative 3. This would reduce the negative, short-term and long-term visual impacts on the landscape as viewed from the Goblin City View Area.

Well pads, wells, and associated infrastructure associated with gas drilling and production would be visible to hikers, hunters, and OHV users throughout the rest of the RDG Project Area. The effects of this construction would be similar to those described for Alternative 2. The presence of these facilities would be consistent with BLM VRM Class IV objectives, which allow for modifications of the landscape that may dominate the view and be the major focus of viewer attention.

4.14.1.4 ALTERNATIVE 4 – NO ACTION

No changes within the RDG Project Area to access or the visual environment would be expected to occur under the No Action Alternative. Hunters and other recreationists in the RDG Project Area would continue to use the roads developed for the existing well network. The BLM anticipates steady growth in recreational use of the trail to the Goblin City View Area for the next several years. The BLM may institute a permitting system for the floating season in order to maintain a quality visitor expectation and recreational opportunity during the peak river-floating season and reduce impacts to goslings on the river.

4.14.2 IMPACTS SUMMARY

The Proposed Action would result in visible impacts as perceived by recreationists at the Goblin City View Area during the duration of natural gas drilling and production. Although most of the proposed wells occur within a VRM Class IV area and would not exceed VRM objectives, the construction of wells, access roads, and associated production facilities would diminish the view of some visitors to the Goblin City View Area. If noted, impacts would degrade the experience

of the visitors to the view area who would have expectations of a remote and relatively natural landscape. This impact would, in turn, diminish the overall experience of some recreationists who float or hike the White River Canyon. Because some visitors associate the hiking with part of their river floating experience, it would then be anticipated that some visitors' expectation of the river float experience along a natural landscape would be diminished.

Alternatives 2 and 3 would result in visible, and possibly audible, impacts as perceived by recreationists at the Goblin City View Area during the duration of natural gas drilling and production, except for the time period between May 15 and June 30. During this time, no construction, drilling, and completion operations would be allowed. If experienced, these impacts would degrade the recreational experience of the visitors to the view area who would have expectations of a remote and relatively natural landscape. This impact would, in turn, diminish the overall experience of some recreationists who float or hike the White River Canyon.

Under Alternative 3 – Additional Environmental Considerations, no wells would be drilled in the UWC proposed wilderness units or White River inventory area. This would have beneficial short-term and long-term effects by preserving wilderness characteristics associated with scenic quality in these areas. Alternative 4 would not greatly affect the existing visual quality of the area.

4.14.3 MITIGATION

4.14.3.1 ALTERNATIVE 1 – PROPOSED ACTION

Measures to conceal proposed well pads and production facilities within areas visible from the Goblin City View Area could include the following, as directed by the AO:

- Using low profile tanks.
- Painting production-related facilities with the exception of surface gathering lines a flat, non-reflective color (e.g., olive black) that is compatible with the surrounding landscape. The color will be chosen during the on-site inspection.
- Not constructing well pads, well drilling, workover, and completion operations at those locations visible from the Goblin City View Area (see Table 4-2) during the peak White River boating season (from mid-May to mid-June) in order to reduce the visual impacts that might be observed by recreationists. The duration of this restriction may be expanded from early May to late June if the BLM implements some type of limited use system for boating of the White River. This restriction would be expected to shift some of the demand for recreation floating to avoid the current peak use season.
- Siting of access roads during the on-site review with the aid of the BLM visual resource specialist to avoid steep side slopes and ridgelines visible from the view areas. Implementation of these measures would partially mitigate potential impacts associated with construction and drilling-related activities.

4.14.3.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

Same as Alternative 1, except that the May 15 to June 30 construction restriction in the vicinity of the Goblin City View Area would be an environmental consideration of this alternative.

4.14.3.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Same as Alternative 2.

4.14.3.4 ALTERNATIVE 4 – NO ACTION

Current mitigation measures would continue.

4.14.4 UNAVOIDABLE ADVERSE EFFECTS

Some areas of natural gas exploration and production would be noticeable. Access roads, well pads, or production facilities might not be visible, but plumes of fugitive dust from service vehicles, the reflection of a distant vehicle windshield in the sun or the black exhaust from a diesel engine might be visible.

4.15 WILDERNESS CHARACTERISTICS

4.15.1 DIRECT AND INDIRECT IMPACTS

Direct effects to wilderness characteristics would occur from construction of roads and well pads and/or operations that would diminish one or more of the following wilderness characteristics: size, roadless character, natural condition, outstanding opportunities for solitude and primitive unconfined recreation, and supplemental wilderness values as identified by BLM personnel. Duration of effects may vary from short- to long-term. Short-term effects would occur during construction activities, and long-term effects would occur when impacts persist after construction activities have been completed.

Indirect effects to wilderness characteristics would occur when wilderness characteristics are lost or diminished by activities other than construction and operation. Sources of indirect effects would include an increase in unauthorized access and associated noise and dust.

4.15.1.1 ALTERNATIVE 1 – PROPOSED ACTION

The RDG Project Area includes 2,317 acres of public land in the southern part of the White River inventory area, near the southern boundary of the area (see Map 2-8). Alternative 1 proposes to drill and operate 15 wells and build 4.5 miles of access roads within this portion of the inventory area. Construction of roads and drill pads would adversely impact the roadless and natural character of most, if not all, of the 2,317 acres in the White River inventory area. The density of planned roads and wells would leave most of this portion of the inventory area in a roaded and unnatural condition. The noise and dust associated with road and well construction

and well drilling would eliminate opportunities for solitude and primitive unconfined recreation within this area during construction and drilling operations. In addition, truck traffic, noise, and dust associated with operation and maintenance of these wells would reduce opportunities for solitude and primitive unconfined recreation. However, as a visitor to the area moves north into the heart of the White River inventory area and away from the sights and sounds of oil and gas production, impacts to opportunities for solitude and primitive recreation would lessen and eventually disappear. Supplemental scenic values would be impacted due to the presence of new roads and well pads. The presence of additional roads and wells, and the operation of producing wells would adversely impact supplemental wildlife values. These impacts would last for the life of the wells, which is expected to be 40 years. Most, if not all, of the 1,926 acres in the White River inventory area would lose their wilderness characteristics.

The RDG Project Area also includes 6,190 acres of public land in the eastern portion of the UWC Lower Bitter Creek proposed wilderness unit the BLM has determined likely have wilderness characteristics. It is proposed to drill and operate 26 wells and build approximately 7.8 miles of new roads to access these wells in this portion of the proposed wilderness unit. Construction of roads and well pads, drilling the wells, and operation of producing wells would have the same impact on the potential wilderness character of this part of the proposed wilderness unit as described in the White River inventory area above. All 6,190 acres in this part of the unit would lose their potential wilderness characteristics for the period of production and until reclamation is complete, as described below. The remaining western portion of the UWC proposed wilderness unit, outside of the RDG Project Area, would still have potential wilderness characteristics.

Further, the RDG Project Area includes approximately 1,688 acres of public land in the UWC White River proposed wilderness unit, an area the BLM also determined is likely to have wilderness characteristics. These lands are contiguous to the southwestern corner of the White River inventory area. It is proposed to drill an additional 9 wells, and build approximately 2.7 miles of new roads to access these wells in this portion of the UWC proposed wilderness unit. Construction of roads and well pads, drilling the wells, and the operation of producing wells would have the same impact on the potential wilderness character of this part of the UWC area as described in the White River inventory area above. All 1,688 acres in this part of the UWC area would lose their potential wilderness character for the period of production and until reclamation is complete, as described below. An indirect effect of the loss of wilderness characteristics in this portion of the UWC proposed wilderness unit would be the separation of another 1,277 acres of the UWC proposed wilderness unit (the area outside the Project Area) from the contiguous White River inventory area (see Map 2-8). Because this area would no longer be contiguous with the White River inventory unit and would be less than 5,000 acres, it would lose its potential wilderness character.

Immediately following reclamation, these areas would not retain their natural character. It is expected that shrub species would re-establish within the RDG Project Area, and a "natural" environment would return within 20 – 40 years. It would take approximately 150 years, however, for mature juniper trees to become re-established.

4.15.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

The short-term and long-term, direct and indirect effects on wilderness characteristics would be similar to those for the Proposed Action.

4.15.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

Under this alternative, no roads or well pads would be constructed in either the White River inventory area or the UWC Lower Bitter Creek and White River proposed wilderness units that the BLM has determined likely have wilderness characteristics. As a result, there would be no adverse impact to the roadless or natural character of these areas. The sights and sounds of exploration, development, and production on lands adjacent to the inventory area and UWC areas would have short-term impact on opportunities for solitude and primitive recreation near the boundaries of these areas. The noise and dust associated with road and well construction, well drilling and truck traffic, noise, and dust associated with operation and maintenance of these wells would reduce opportunities for solitude and primitive unconfined recreation for some distance near the boundaries of the inventory area and UWC areas. However, as a visitor to these areas moves away from the boundaries into the heart of the inventory area and UWC areas, impacts to opportunities for solitude and primitive recreation would lessen and eventually disappear.

No lands in the White River inventory area or the UWC Lower Bitter Creek and White River proposed wilderness units would lose their wilderness characteristics.

4.15.1.4 ALTERNATIVE 4 – NO ACTION

Under this alternative, current land practices would continue and, eventually, wells would be drilled on existing leases within the White River inventory area and the UWC Lower Bitter Creek and White River proposed wilderness units that the BLM has determined are likely to have wilderness characteristics. Impacts would be similar in nature to those described for Alternative 1, but less in scope (i.e., fewer wells would be drilled).

4.15.2 IMPACTS SUMMARY

Alternative 1 would result in a loss of most of the roadless and natural character on 2,317 acres in portions of the White River inventory area. This alternative would also result in the loss of opportunities for solitude and primitive unconfined recreation on 6,190 acres within the UWC Lower Bitter Creek proposed wilderness unit, and 1,688 acres within the UWC White River proposed wilderness unit. An indirect effect of the loss of wilderness characteristics in the UWC White River proposed wilderness unit would be the separation of another 1,277 acres of the UWC proposed wilderness unit (the area outside the Project Area) from the contiguous White River inventory area, which would also lose their wilderness characteristics.

Under Alternative 2, the impacts to the wilderness character of the White River inventory area and the two UWC proposed wilderness units would be similar to Alternative 1.

Under Alternative 3 – Additional Environmental Considerations, there would be no impacts to the wilderness character of the White River inventory unit and potential wilderness character of the two UWC proposed wilderness units.

Alternative 4 would have impacts similar in nature to impacts listed for Alternative 1, but not necessarily similar in scope (i.e., fewer wells would be drilled).

4.15.3 MITIGATION

No additional mitigation is recommended.

4.15.4 UNAVOIDABLE ADVERSE EFFECTS

Unavoidable direct and indirect adverse effects would occur under Alternatives 1 and 4:

- Alternative 1 would allow development of 50 wells and 15.0 miles of roads.
- Alternative 2 would be the same as Alternative 1.
- There would be no unavoidable adverse impacts under Alternative 3.
- Alternative 4 would have effects similar in nature to impacts for Alternative 1, but less in scope.

The area of disturbance would be greatest for Alternatives 1 and 2. No lands would be disturbed under Alternatives 3. The impacts for Alternative 4 would be similar to Alternatives 1 and 2, but reduced in scope. There is the potential for indirect unavoidable adverse impacts that would include OHV use and unauthorized access, and associated noise and dust.

4.16 SOCIOECONOMICS

4.16.1 DIRECT AND INDIRECT EFFECTS

4.16.1.1 ALTERNATIVE 1 – PROPOSED ACTION

4.16.1.1.1 Population

The Proposed Action is not expected to result in a significant short- or long-term impact to the overall population of Uintah and Duchesne Counties. It is anticipated that many of the workers will come from local communities in the surrounding area. It is not anticipated that demographics would be substantially altered in the long run from the effects of this alternative.

4.16.1.1.2 Employment and Wages

Implementation of the proposed project would create some additional employment opportunities in Uintah County. Due to the nature of the large time frame of the project (up to 40 years), coupled with the fluctuation in natural gas economics, developing exact projections of employment is extremely difficult. Therefore, the following paragraphs provide a reasonable estimate of what employment impacts could likely be expected with project implementation.

Both direct project employment (e.g., positions within RDG or contractors hired for construction, production, and decommissioning) and indirect or secondary employment (jobs that become available in support industries as a result of project activities, such as parts and mineral production, equipment refueling, etc.) would arise as a result of project activities.

As mentioned in Chapter 2, the estimated workforce requirements for the construction of 423 wells would be 1,781 worker-years (see Table 4-3). The lifetime of the project is anticipated to be between 10 and 20 years, which equates to 89-178 full-time employees a year during the lifetime of the project. This would represent an increase of 6–12% in the mining sector, or 1–2% of the total in the non-agriculture employment sector. These jobs may attract new employees to the local market, but it is just as likely that the availability of higher paying jobs would incentivize local workers to change jobs within the community, causing a moderate shift in the local market.

Table 4-3. Estimated Workforce Requirements for 423 Wells [1]

Employment Category	Worker-Days per Well[2]	Total Worker-Years for Project[3]
Well Construction and Development		
Construction	15	24
Drilling (15 days × 7 people × 3 shifts)	315	512
Completion	114	185
Operations and Maintenance		
Production (10 years)	685	930
Workovers (every 3 years)	36	49
Abandonment (reclamation)	50	81
Total	1,215	1,781

[1]Assuming that 362 wells are drilled and completed as producers and 70 wells are drilled and abandoned as dry.

[2]For a producing well.

[3]260 worker-days = 1 worker-year. Totals have been adjusted to account for non-producing wells.

If the average wage of a full-time employee in the mining sector were $40,000, an increase of 89 to 178 jobs would equate to $3.56 to $7.12 million in wages to the community annually. This is an increase of 1.5–3.1% in total wages and salaries for Uintah County.

4.16.1.1.3 Public Finance

Production activated and facilities associated with the project would generate revenue for local, county, state, and federal governments through royalties, production taxes, and property taxes. Local expenditures by RDG operator employees for housing, food, fuel, repairs, and supplies also would generate sales tax and income tax revenues and support local merchants.

Tax and royalty revenue would be realized for the life of the project, with diminishing returns after maximum production is reached. The federal or state royalty and severance tax revenue generated from oil and gas operations is a function of the amount of the commodity produced.

The Proposed Action, which includes the development of 423 wells, is estimated to recover 448.3 billion cubic feet of natural gas over a 10-20 year period at the rate of 15-40 new wells drilled each year.

According to the Utah Energy Office the average wellhead price for natural gas in 2004 was approximately $5.26 per thousand cubic feet. This provides an estimate of about $2.36 billion in revenue production.

Royalty revenue to the federal, state, and county governments would equal approximately 12.5% of production revenue, or nearly $295 million. Severance taxes and *ad valorem* taxes will be paid to Uintah County based on the production of the well or the depreciated value of the equipment on the property whichever is higher. In Uintah County, the severance tax rate on production is 5% of revenue and *ad valorem* tax rate is 3.6%.

4.16.1.2 ALTERNATIVE 2 – ADDITIONAL WILDLIFE CONSIDERATIONS

4.16.1.2.1 Population

Same as Alternative 1, with no long-term impacts to Uintah or Duchesne Counties.

4.16.1.2.2 Employment and Wages

It is anticipated that employment effects would be similar to Alternative 1.

4.16.1.2.3 Public Finance

The revenue generated from royalties, production and property taxes would be the same as Alternative 1.

4.16.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

4.16.1.3.1 Population

Same as Alternative 1, with no long-term impacts to Uintah or Duchesne Counties.

4.16.1.3.2 Employment and Wages

It is anticipated that employment effects would be similar to Alternative 1.

4.16.1.3.3 Public Finance

Given that 50 fewer wells would be drilled under Alternative 3, the revenue generated from royalties, production, and property taxes would total 12% less than Alternatives 1 and 2 (about $260 million less).

4.16.1.4 ALTERNATIVE 4 – NO ACTION

4.16.1.4.1 Population

Same as Alternative 1, with no long-term impacts to Uintah or Duchesne Counties.

4.16.1.4.2 Employment and Wages

It is anticipated that employment effects from this alternative would be only 13% of the Proposed Action (12-23 more jobs). This would represent an increase of approximately 0.1–0.2% of total non-agriculture employment in the county.

4.16.1.4.3 Public Finance

The revenue generated from royalties, production, and property taxes on a total of 55 wells would total 87% less than Alternatives 1 and 2 (about $38 million less).

4.16.2 IMPACTS SUMMARY

The long-term productivity of this and other natural gas field will affect whether these jobs are additional jobs or the same employees transferring between two locations. If new jobs are created, then an increase in mining-related employment of 6–12% would be anticipated, with an increase in wages of between $3.5 million and $7.0 million annually; however, total non-agriculture employment and wages as a whole would not be significantly increased. If these jobs were the result of employees transferring within Duchesne and Uintah Counties, then no net benefits would be anticipated.

4.16.3 MITIGATION

No additional mitigation is recommended.

4.16.4 UNAVOIDABLE ADVERSE IMPACTS

None.

4.17 NOISE

The EPA has established an average 24-hour, day-night sound level (L_{dn}) of 55 decibels A-weighted (dBA) to protect against activity interference and loss of hearing (see Table 3-12). No data are available on noise levels that affect domesticated animals or wildlife. During drilling and well pad construction, noise impacts would be temporary at any given location throughout the RDG Project Area, produced by vehicles and construction equipment. Gas pumping facilities would produce long-term noise effects, and the perception of project-related noise would depend on a number of factors including topography, meteorological conditions, and the distance from the noise source.

Noise levels have been estimated for construction equipment that would be used for gas exploration and development. Table 4-4 shows the levels of noise produced by construction equipment typically used to construct gas exploration and development facilities. It is expected that short-term noise levels would be above the EPA-recommended noise level of 55 dBA at least to 1,000 feet from any well during construction.

Table 4-4. Typical Construction Equipment Noise

Equipment	Noise Level (dBA)		
	50 feet	500 feet	1,000 feet
Bulldozer	89	69	63
Crane	88	68	62
Dump Truck	88	68	62
Tractor	80	60	54
Backhoe	85	65	59
Air Compressor	82	62	56

Source: BLM 1999a.

4.17.1 Direct and Indirect Effects

4.17.1.1 Alternative 1 – Proposed Action

Noise from construction, production, and drilling-related activities could be perceptible from the Goblin City Overlook view area, and throughout the RDG Project Area. The magnitude of such noise levels would be low, given the distance the proposed facilities would be located from the view area, and it is anticipated that noise would only be audible under certain meteorological conditions, e.g., light winds from the south, the absence of winds, or during atmospheric inversions. However, it is reasonable to assume that these noises, when perceptible, could diminish the sense of remoteness provided at the view area, and in those areas where recreational opportunities for remoteness are expected.

4.17.1.2 Alternative 2 – Additional Wildlife Considerations

The noise effects would be similar to those described under the Proposed Action. However, noise produced by construction, production, and drilling-related activities could be perceptible from the Goblin City view area, but not during the peak river floating season from May 15 to June 30, when no construction, drilling, or completion operations would be allowed. As with the Proposed Action, the magnitude of such noise levels would be low, given the distance proposed facilities would be located from the view area, and could only be audible under certain meteorological conditions, e.g., light winds from the south, the absence of winds, or during atmospheric inversions. Noise effects would be reduced in the crucial deer winter range from November 15 to April 15, as no surface disturbance, construction, or completion operations would be allowed during this time. However, it is reasonable to assume that these noises, when perceptible, could

diminish the sense of remoteness provided at the view area, and in those areas where recreational opportunities for remoteness are expected. Some wellsites may be relocated to protect physical and biological resources, and relocation may decrease noise affects within these sensitive areas.

4.17.1.3 ALTERNATIVE 3 – ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

The effects of noise within the RDG Project Area would be similar to that under Alternative 2, with the additional surface restrictions that would prevent surface disturbance, well construction, or completion within critical mule deer winter range between November 15 and April 15. Also, fewer wells would be drilled within the RDG Project Area in order to protect wilderness characteristics. These surface restrictions would reduce the impacts of noise on wildlife and recreational activities in these sensitive areas.

4.17.1.4 ALTERNATIVE 4 – NO ACTION

Noise levels within the RDG Project Area, under Alternative 4, would not be changed from their historical levels. The rate of wells drilled (3-5 per year) would not have an important effect on existing noise levels.

4.17.2 IMPACTS SUMMARY

Noise levels would be above the EPA-recommended noise level of 55 dBA at least 1,000 feet from any well construction site. However, no residences exist within the RDG Project Area, and thus, there would not be any effects of well construction noise on human populations. Noise produced under Alternative 1 could affect the viewer experience from the Goblin City Overlook, depending upon meteorological conditions. Alternatives 2 and 3 would reduce the potential for noise effects from the Goblin City Overlook by limiting construction during the peak White River rafting season (March 15 through June 30), and by limiting construction in mule deer crucial/critical winter range. Alternative 3 – Additional Environmental Considerations would prevent drilling in areas that have been determined to possess wilderness characteristics. Present noise levels would remain unchanged under Alternative 4.

4.17.3 MITIGATION

No additional mitigation is recommended.

4.17.4 UNAVOIDABLE ADVERSE EFFECTS

Noise produced by construction equipment and drilling rigs during gas exploration and development would be short-term, but an unavoidable impact.

4.18 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section identifies those resources that would be lost, either temporarily or permanently, as a result of implementing the Proposed Action or its alternatives. *Irreversible* refers to those

resource commitments that cannot be reversed, except perhaps in the extreme long-term, effectively limiting land uses and resources. *Irretrievable* refers to those resource commitments that would use, eliminate, consume, destroy, or degrade the productivity or utility of those resources within the RDG Project Area for the lifetime of the project.

No irreversible or irretrievable effects would occur to air quality, visual, or noise resources. The irreversible and irretrievable effects that would or could occur to other resources analyzed in the EIS are listed below.

4.18.1 IRREVERSIBLE EFFECTS

- Removal of natural gas
- Transfer of water from the Wasatch Formation and Evacuation Creek
- Accidental death of sensitive species
- Accidental destruction of cultural resources
- Accidental destruction of paleontological resources
- Loss of a natural recreational setting
- Accidental killing of livestock

4.18.2 IRRETRIEVABLE EFFECTS

- Loss of vegetative cover prior to reclamation success
- Loss of riparian vegetation during the project lifetime
- Loss of portions of big game winter range during the project lifetime
- Loss of sensitive species habitat
- Loss of livestock forage prior to reclamation success

4.19 RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This section describes possible consequences to long-term productivity from short-term environmental uses associated with the Proposed Action. Short-term refers to the total duration of the Proposed Action (including seismic surveying and exploratory drilling), whereas long-term refers to an indefinite period beyond the termination of gas development activities. The specific impacts of the Proposed Action vary in kind, intensity, and duration according to the activities occurring at any given time.

Development drilling occurs sporadically throughout the life of an oil or gas field, but also results in short-term, localized impacts. Activities during the production life of a field may result in chronic impacts over a longer period of time (25 to 35 years), potentially punctuated by more severe impacts as a result of accidental events such as spills. Facility abandonment is also a short-term activity with localized impacts. The impacts of the removal of gravel pads and roads may be longer lasting. Over the long term—several decades to several hundreds of years—many environmental conditions would likely be restored to near pre-development conditions and productivity. Most of the impacts described in this chapter would be short-term, lasting through

the duration of project construction, operations, and abandonment. Some impacts to the physical, biological, and social environment would remain after operations cease and abandonment and reclamation has occurred. These impacts are described below.

- Gas that is extracted would be permanently removed from the Project Area. Any inadvertent effects on cultural or paleontological resources that occur during construction, operation, abandonment, or reclamation would result in long-term impacts.
- Vegetation and habitat that would be displaced by gravel extraction and fill placement may be permanently lost if gravel fill is not removed during reclamation. If gravel fill were to be removed, revegetation of extraction and placement areas to near pre-project conditions would require many years. The amount of permanent habitat loss and the disturbances to fish and wildlife that would occur during project construction, operations, and abandonment would have negligible effects on populations; therefore, these resources would not sustain permanent impacts. However, 1:1 or 1:1.5 mitigation activities would decrease the short-term cost substantially.
- Current plans to reclaim gravel roads and pads would limit decreases in long-term productivity; however, local residents may use gravel roads during the life of the project to access areas not previously accessible. Annual revenues and taxes resulting from gas development in the area would cease upon the conclusion of project operations. The loss of these economic benefits could have long-term impacts to the local and regional economy if other resource development revenues do not replace them.